Aesthetic-School Effects in Artists' Age-Valuation Profiles: Evidence from Eighteenth-Century Rococo and Neoclassical Painters

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Abstract

Age-valuation profiles for artists' works are to some degree analogous to age-earnings profiles for workers more generally, and are of interest for valuation of art objects as well as for what they reveal about artists' career dynamics. A number of writers have hypothesized that the school, or style, characterizing an artist's work may have implications for the form of age-valuation profile, and in particular for the peak (the age of execution at which an artist's works are most highly valued). The second half of the 18th century provides an interesting potential test, because socioeconomic and political changes at this time were paralleled by revolutionary change in the fine arts, especially painting, witnessing major changes in subject manner and aesthetic style among prominent artists. We revisit the hypothesis using data on auction sales of works from this time, estimating hedonic age-valuation profiles using a novel data set. We pool our set of artists to estimate profiles for different birth cohorts, also using a specification where profiles shift continuously with year of birth. We also use dimension-reduction and model-averaging techniques to allow estimation of individual profiles for several artists, despite limited sample sizes.

Key words: age-valuation profile, art market, auction prices, dimension reduction, model averaging, neoclassical painting

JEL Classification number: Z11

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1 Introduction

There is a substantial literature on age-earnings profiles for wage earners, and some empirical facts–in particular, that the profiles rise relatively quickly for younger workers, are single-peaked, and decline slowly from the peak to retirement–appear to hold quite generally (see for example Murphy and Welch 1990). The problem of relating the valuation placed on a work of art to the age of the artist when it was executed is similar, but of course not identical: the artist's total earnings depend as well on the number of works produced, for example, which will also tend to vary with age. Nonetheless, somewhat similar single-peaked patterns also tend to emerge in studies of the age-valuation relationship. The age at which this peak occurs, however, seems to be quite variable, and the causal influences on the age of peak valuation have yet to be established.

The development of technical ability, or craftsmanship, over a career is one factor that is very likely to affect valuation; this would tend to suggest valuations peaking late in a career, or indeed rising throughout. A number of authors, most notably Galenson and co-authors, have argued that the aesthetic school to which the artist belongs is another factor determining the age of peak valuation. In a series of influential studies, Galenson (2000, 2001, 2009) and Galenson and Weinberg (2000, 2001) estimate hedonic age-valuation profiles for different cohorts of artists and find that in both the French and American cases, the younger cohort, that is, the one working in a more "conceptual" or "linear" manner, has an age-valuation profile that "peaks" much earlier in life, suggesting that the aptitudes to excel in this artistic category are relatively stronger among younger people. This latter hypothesis has stimulated a number of subsequent studies of painters' careers, including Ginsburgh and Weyers (2006), who consider selected Old Master painters, Accominotti (2009) and Hellmanzik (2009, 2010), who consider modern artists, and Hodgson (2011), and Galbraith and Hodgson (2012), who study a sample of Canadian artists. Overall, the results are rather mixed, and the Galenson hypothesis has been criticized by many.

In the present study we revisit this hypothesis in analyzing a new data set of auction sales by eighteenth century European artists, using a set of complementary econometric methods that allow us to examine individual as well as aggregated results. We view this century as an ideal one to provide evidence on the relation between aesthetic style and career patterns of productivity as predicted by the Galenson hypothesis, because there was a clear and wide-ranging change in the dominant style of European painting during the century, which accompanied a similar change in the nature of the subjects most commonly depicted. Important overviews of eighteenth-century painting are provided by Levey (1977, 1993) and Rosenblum (1974). Most pertinent to our study is Rosenblum (1976), which focuses very specifically on the evolution of aesthetic styles during the century towards one that was highly linear and planar. Section 2 of the paper elaborates on this point, and the generalizations made below are largely derived from our reading of these sources.

Before entering into a detailed presentation of artistic trends in the eighteenth century, we will briefly discuss certain general themes in aesthetic styles that have been seen by economists as being relevant to the career age-valuation profiles of painters. A stylistic dichotomy has been held for centuries to exist between art works that are more "painterly" or "coloristic" in nature, and those which are more "linear" or "drawing-based". The former category is often also associated with a greater presence of the illusion of depth in the picture, whereas the latter has often been associated with a more planar and explicitly two-dimensional presentation. The dichotomy was emphasized by Vasari (1996), in his *Lives of the Artists,* the first edition of which was first published in 1550. Vasari contrasted the drawing-based style of the contemporary Florentine and Roman School, led by Michelangelo, with the painterly style of the Venetians, led by Titian. He considered the former grouping, of which he was himself a member, to be the superior, because of the greater conceptual and formal rigor of the linear style, which appealed to the viewer's intellect, as opposed to the more sensual and less-disciplined Venetian style. This dichotomy, and the association of linear and less coloristic art with intellectual and conceptual seriousness, as opposed to the weak-minded frivolity of the visually appealing coloristic style, has persisted through the ages and continues to be very strong today.

Something very similar to what we are calling the Galenson hypothesis has been around for at least 400 years. The Dutch artist and theorist Carel van Mander (1548-1606) made the distinction between two styles of painting, the "smooth", in which individual brush strokes are finely blended together such as to be invisible except when viewed at very close range, and the "rough", in which brush strokes are applied in a much broader and flourishing manner (see van Mander (2009), and the recent art historical discussion of his theory provided by Tummers (2013)). This latter, "painterly", approach, associated especially with Venetian masters such as Titian, is considered by van Mander to demand a very high level of virtuosity, to be much more difficult to master, and those artists who adopt this approach would in general only do high quality work later in their careers, once the required mastery had been gradually developed through practical experience. We thus refer to the hypothesis that we are analyzing as the "van Mander-Galenson" hypothesis.

Historians and critics have characterized entire art-historical periods as being dominated by one or the other of these styles, and have attempted to identify paradigmatic shifts that have occurred in relatively short periods of time. Wolfflin (1950), for example, famously described in great detail the Europe-wide stylistic change that took place in all the visual arts in the years around 1600. The latter sixteenth century was characterized by the Michaelangelesque linear aesthetic advocated by Vasari and known as Mannerism. This approach was largely replaced in the seventeenth century by the flamboyant, illusionistic, painterly style known as the Baroque. The new style was advocated by Roger de Piles (1708), whose theory of art maintained the distinction between linearity and coloristic painterliness, this time preferring the latter due to its greater naturalism. This theory heavily influenced artistic production for much of the eighteenth century, as we shall see.

A similar shift was identified by Clement Greenberg (1993, p.294) in post-war American modern art around 1960, this time away from the painterly style of the abstract expressionists towards the planar linearity of the hard-edged abstractionists, pop artists, and minimalists. The economic implications for the careers of American modern artists of this shift in the dominant aesthetic style were investigated by Galenson (2000, 2001, 2009) and Galenson and Weinberg (2000), with the ideas then being extended to a similar shift observed by these authors and Galenson and Weinberg (2001) in French modern painting around the year 1900. In these studies, the dichotomy between categories of artists is not stated in completely aesthetic terms, but rather in terms of approaches to artistic creation that are termed as "experimental" and "conceptual"; Ginsburgh and Weyers (2006) argue that this dichotomy is difficult to work with as it depends on background information about the artists' work practices that may not easily be available, and suggest that it can, in any event, be replaced by, and largely mapped onto, the old distinction between coloristic and linear aesthetics.

Below, then, we investigate the explanatory power of these classifications using a new data set combined with statistical technique that allows us to estimate individual-level age-valuation profiles rather than only the pooled profiles that are common in the literature. We begin by providing some general background on the art history of the period and the art-historical hypotheses to be investigated, followed by an exposition of the data and econometric methods to be used.

2 European art in the eighteenth century

This section documents some of the changes in aesthetic style during the 18th century which make this period particularly useful for us in investigating the possible effects of such changes on age-valuation profiles for individual artists.

The second half of the eighteenth century witnessed momentous changes in western society - social, economic, political, and cultural. Associated with these were revolutionary developments in all of the fine arts. Perhaps the most important and noteworthy of these appeared in the visual arts, especially painting. Major changes in prevailing norms both in terms of subject matter and of style of visual representation took place. These changes occurred in many of the major artistic centres of Europe, especially Rome and London, but the site of the most striking developments was the period's artistic capital, Paris.

The artistic life in Paris in these years was intimately connected with political developments, and the linkages between the artistic revolution and the broader French Revolution are very tight. To appreciate this, one need only consider that the leader of the new movement in painting was Jacques-Louis David, a fervent supporter of the French Revolution who occupied a number of official posts in its early years; he was elected Deputy to the National Convention in 1792 as a member of Robespierre's radical ruling faction, was a member of the notorious Committee for Public Security, and in January 1793 he was among the majority of deputies who voted in favor of the execution of Louis XVI.

The eighteenth century opened under the influence of de Piles with the predominant artistic style being the Baroque, the epitome of the coloristic, painterly manner. Louis XIV was still on the throne, and the early years of the new century were essentially a continuation of the previous one. As the century progressed, the Baroque evolved into the related style known as the Rococo, with the de Piles influence continuing to dominate. Colors became softer and more pastel-like, and subject matter generally lighter, in keeping with the overall culture of late years of the *ancien régime*. If anything, the emphasis on painterly virtuosity increased, with the mid-century Rococo style being epitomized by the great masters Jean-Antoine Watteau (1684-1721), with his hazy, elegiac views of aristocratic *fêtes galantes* and *commedia del arte* characters, and François Boucher (1703-1770), the favorite artist of Madame Pompadour, best known for pastoral scenes of young lovers and erotic depictions of the loves of the Greek gods.

The neoclassical revolution that took place in European art in the final third of the century is a complex phenomenon that has generated an enormous art-historical literature. We will only attempt here to point out certain of its characteristics that are most relevant to our study. Although the leader of the movement was Jacques-Louis David, whose *Oath of the Horatii* (1784) [1] caused one of the greatest sensations in art history, certain earlier artists had started moving in the direction of classically-inspired art, most notably Joseph-Marie Vien (1716-1809), David's teacher, who depicted scenes from antiquity in a shallow pictorial space, inspired by artworks recently unearthed at Pompeii and Herculaneum, that foreshadowed the more dramatic and austere style of David. Despite his stylistic innovations, Vien's subject matter was largely characteristic of the Rococo, often featuring mildly erotic scenes of lightly attired young women. Among his best-known works are *La Marchande d'Amours* (1763),[2] and *Greek Woman at the Bath* (1763).[3]

The neoclassical style in France is closely associated with David and the many pupils in his *atelier* (workshop), who were among the most talented, ambitious and progressive young artists at the time. Many would become famous, including François Gerard (1770-1837), Anne-Louis Girodet (1767-1824), François-Marius Granet (1775-1849), and Jean Auguste Dominique Ingres (1780-1867). The atmosphere in David's atelier was highly competitive, each young artist attempting to distinguish himself by the originality and intellectual sophistication of themes

[1]See http://www.louvre.fr/en/oeuvre-notices/oath-horatii

[2]See http://fr.topic-topos.com/la-marchande-d-amours-fontainebleau

[3]See http://www.museumsyndicate.com/item.php?item=33008

chosen for his paintings as well as in their compositions (Crow 2006). David had been a rebel against the Rococo style which he saw as frivolous, intellectually weak, and infused with the corruption and ineffectuality of the *ancien régime.* To reflect the seriousness of purpose and intellectual rigour of the revolutionary epoque and the new generation of Frenchmen, painting had to treat themes of moral elevation, often taken from ancient history, and the formal style had to reflect this serious intellectual mission. Only a classical, linear style, based on the antique art that was becoming popular at this time, possessed the necessary qualities.

Thus the association of the classical aesthetic style with conceptual rigour and sophistication was seen in the neoclassical period as being a necessary one. Along with the presence of a large group of motivated young artists exploring the implications of a new pictorial style, this period is in many respects very similar to that which held in Paris around 1900 or in New York around 1960, as analyzed by Galenson (2000, 2001, 2009) and Galenson and Weinberg (2000, 2001).

3 Art auction data and hedonic model specification

To consider the explanatory power of these classifications for artists' careers, we investigate the relation between the period's stylistic evolution and the evidence on career patterns reflected in estimated age-valuation profiles obtained from auction sales data, in particular with respect to the hypothesis that the profiles would tend to peak at earlier ages for artists born later. We analyze a novel data set of auction sales of paintings and works on paper eighteenth century artists, using pooled hedonic regressions to investigate possible changes in age-valuation profiles between birth cohorts, considering both discrete cohort break points, as well as a specification in which the parameters of the estimated profile are allowed to shift continuously with the year of birth of the artist (Hodgson 2011). We also estimate individual age-valuation profiles for individual artists, addressing the small-sample-size problem in this case by employing dimension-reduction and model-averaging methods as applied by Galbraith and Hodgson (2012) for a set of Canadian artists.

Age-price profiles for artists will be estimated in the framework of a hedonic regression model in which the dependent variable is log-price of the sale of a painting at auction, and the possibly large set of independent variables includes the artist's age at the time of execution of the work, included in polynomial form, the height, width, and surface area of the work, dummy variables for the date of the sale, the medium/support combination (painting, work on paper, or miniature), the genre of the work's subject matter, the auction house, and, in the specification where artists are pooled together, dummies for artist identity. [4] In the pooled model, all of the artists included in the sample are grouped together, whereas in the individual-artist

[4] The authors assembled the data set from Artprice.com.

models, a separate regression is estimated for each artist. The 63 artists included, along with numbers of observations, are listed in Appendix A.

One can imagine that the effect of the hedonic regressors on price could be different across painters, especially when it comes to age effects, suggesting the interest in estimating artist-specific models. However, degrees of freedom problems arise, since the number of observations for a given painter may not be much more than – in fact, may be less than – the number of potential regressors. One can in practice reduce the number of regressors by arbitrarily excluding variables (such as, for example, genre or auction house) or by arbitrarily redefining certain dummy variables to reduce their numbers (individual time-period dummies for five- or ten-year periods rather than for each year, for example). Both expedients are used by Galenson (2000). However, it is possible that important information is lost when exclusion restrictions are imposed. In this paper, we will instead use the two alternative approaches used by Galbraith and Hodgson (2012): reducing the dimension of the regressor matrix in a data-dependent fashion that retains information in all regressors, and averaging results for a number of models in which different regressors have been excluded.

For each of the artists analyzed, we recorded every sale at auction of a dated painting, miniature, or original work on paper available through the Artprice.com database, which covers the years 1986-2012. Painters were chosen based on our reading of a variety of sources on eighteenth century art, with an attempt to include the most important artists active in all periods of the century, with artists working in a variety of styles, and of different national backgrounds.

In the literature on the age-valuation relationship, age generally enters as a polynomial function with between two and four terms, reflecting a similar modeling of age-wage or experience-wage profiles in the labor economics literature (e.g. Mincer 1974). Hodgson (2011) estimates a fourth-order polynomial for the overall and cohort regressions for Canadian artists, as well as for the specification with continuously shifting profile. Galenson (2000) allows for up to three polynomial terms in each individual-artist regression, with the exact number in each case being selected based on the best $\overline{R}^2$ fit. Here, given the sample-size constraints, we use a quadratic specification for each artist, and in the pooled model employ three specifications for the age-valuation profile, as described in detail below.

In general, a hedonic regression model is written as follows:

$$
\begin{aligned}
p_i &= \sum_{t=1}^{T} \gamma_t z_{it} + \sum_{j=1}^{J} \alpha_j w_{ij} + g\left(w_i, \beta\right) + u_i && (1) \\
&= \beta' x_i + u_i, && (2)
\end{aligned}
$$

where the sales are indexed by $i = 1, ..., n$, with p_i being the log price for sale i, z_{it} a dummy equal 1 if observation i occurs in period t, zero otherwise, γ_t the parameter on time period dummy, representing the value of the market in period t after controlling for all other factors, w_{ij} the observation on covariate j, α_j the associated parameter, and u_i a zero-mean disturbance, independent of the regressors. The covariates included in the regression are the variables mentioned above (dummies for genre, medium/support, and artist (pooled model only) as well as size measures mentioned above, and auction house). The term $g(w_i, \beta)$ is a function of the artist's age w_i at the time of creation of the art work and a vector β of parameters, to be estimated.

As estimation of β is a principal objective of this paper, we provide details here on the different specifications we will be using. The benchmark is the basic quadratic in age,

$$g(w_i, \beta) = \beta_1 w_i + \beta_2 w_i^2. \tag{3}$$

This specification will be the first of three to be estimated with all artists pooled together, and it will be the only specification for the individual-artist regressions.

Secondly, with the pooled data, we will divide all of the artists into two groups, based on birth date. The first group, born in or before 1734, will be referred to as the "Rococo" group, and those born afterward will be included in the "Neoclassical" group (these labels are very loosely used to reflect overall historical tendencies and not necessarily as an accurate description of the aesthetic of every individual artist in each category). Separate polynomial parameters will be estimated for each group; the main hypothesis we seek to investigate is that the polynomial implied by the parameters of the neoclassical cohort should peak earlier in life than for the Rococo artists. The model is as follows:

$$g(w_i, \beta) = \sum_{j=1}^{2} \sum_{\ell=1}^{2} \beta_{j\ell} w_i^{\ell} I\left(i \in coh(j)\right), \tag{4}$$

where $I(\cdot)$ is the indicator function with $coh(1)$ refers to the Rococo cohort and $coh(2)$ the neoclassical one.

The third specification of the age-valuation profile, also only estimated for the pooled model, and similar to the one introduced by Hodgson (2011), is a generalization of the second specification in which the parameters of the quadratic polynomial do not undergo a single discrete shift but rather shift continuously as a function of the year of birth of the artist:

$$g(w_i, \beta) = \sum_{\ell=1}^{2} \left(\beta_\ell w_i^{\ell} + \beta_{\ell+2} w_i^{\ell} db_i\right) \tag{5}$$

where db_i is the date of birth of the artist associated with observation i.

The pooled models will be estimated by ordinary least squares (OLS) with heteroskedasticity-consistent standard errors. The degree-of-freedom deficiency renders OLS estimation difficult or impossible in the individual-artist regressions, so in the next section we outline the methods we will adopt to address this problem.

4 Individual-artist regression methodology

The pooled models use the full sample of works of art sold at auction, aggregating 63 artists, and containing 1344 observations. The individual sample sizes range from one to 124, and there are 23 artists for whom a sample of at least 25 sample points are available. For this set of 23, we estimate age-valuation profiles at the individual level. These sample sizes are small, and in most cases smaller than the number of potential explanatory factors available. In order to undertake estimation on these samples we must either eliminate many of the potential regressors, or use alternative statistical methods to extract information from the full set.

The methods that we will use were suggested by Hansen (2007) and Galbraith and Zinde-Walsh (2011). We will give a very brief review here, based on the description in Galbraith and Hodgson (2012).

Consider for illustration a situation in which we have 25 sample points and 50 measured explanatory factors which theory suggests may be relevant. We cannot include all 50 in an OLS regression. A typical response to this would be to make a judgment of several–perhaps 3 to 5 here–of these factors to include, based on *a priori* considerations. Of course, different investigators will make different modeling choices, and results may differ substantially. In each model, much information will be omitted.

Another class of response to the problem, exemplified by Hansen (2007), is to average results of different small models. In this way information from many, potentially all, of the regressors can be embodied into the results, usually using information criteria to weight the different models. Model-average estimators can be shown to produce substantially lower average loss measures (such as MSE) than typical single-model selection methods.

In the notation of Galbraith and Hodgson (2012), we begin with a model of interest:

$$y = c + X\beta + Z\gamma + \epsilon, \tag{6}$$

where X represents an $\ell-$ dimensional effect of interest to be included in all models and Z is a $K-$dimensional vector of additional potential explanatory factors. Here y represents the value of an art object sold at auction and X will include the age effects on valuation, interpretation of which is crucial to the present study. Choose a set of M models or an ordering and maximum number M of regressors from Z to include, with $\ell < M < N$ where N is the sample size, and estimate all models in the set or with m regressors, $m = \ell, \ell+1, \ldots, M$. The model average estimator is $\hat{\Theta} = \sum_{m=\ell}^{M} \omega_m \hat{\theta}_m$, where ω_m is the weight given to model m and $\hat{\theta}_m$ is the parameter vector estimated using a model with m regressors, padded with zeroes for excluded variables where $m < M$. The estimates of β are weighted averages of the individual-model estimates, with weights chosen to minimize the Mallows criterion in Hansen (2007), or an asymptotically equivalent criterion in Xie (2013).

Another way of aggregating information from a large number of regressors is to combine the information from these explanatory factors from these in a single regression, rather than combining information from many different regressions. Galbraith and Zinde-Walsh (2011) suggest doing so by isolating the regressors whose coefficients are of interest, and extracting information from the remaining regressors by orthogonal ionization, and principal components or related orderings. A single regression model results, with the number of regressors determined by, e.g., information criteria.

Beginning again with equation (6), orthogonalize the regressors in Z and extract the K principal components. Define $S(\kappa, K)$ as the matrix containing the first κ of these, where κ may be chosen by an information criterion such as Akaike's. Next estimate β using the auxiliary model with orthogonalized control regressors $S(\kappa, K)$:

$$y = c + X\beta + S(\kappa, K)\delta + e. \tag{7}$$

Note that estimation using (7) incorporates information from all columns of Z. The estimates of the parameters β can be interpreted in the usual way; here these will correspond, as in the model averaging case, with the age effects which are important to the present study.

5 Empirical results

5.1 Pooled regressions

The parameter estimates of the aforementioned three specifications estimated with pooled data are reported in Tables 1 and 2, and the implied age-valuation profiles are plotted in Figures 1-3. In all cases, the model was estimated by ordinary least squares (OLS). For the second specification, the 63 artists included are divided into two discrete "cohorts" based on birth year, and we use 1735 as the dividing point, with all artists born before this date categorized as "Rococo", and those born afterward termed "Neoclassical". These expressions are of course used only as convenient generalizations and should not be taken to apply to the specific aesthetic of each individual artist in each category. We have 1344 observations, with 800 for the first group and 544 for the second.

All regressions were estimated by OLS with White heteroskedasticity-consistent standard errors. Observations were down-weighted by the square root of the number of observations per individual artists. Results without down-weighting are broadly similar, as were the results obtained when the regressions were estimated using the semiparametric efficient adaptive estimator of Bickel (1982), as is done by Hodgson and Vorkink (2004).

In the first model, with all artists pooled together, the quadratic OLS coefficients are individually and jointly significant (Table 1, line 1), and we obtain a profile that peaks at approximately 46 years of age (Figure 1). (The profiles are identified up to a vertical shift, and in all of the graphs are normalized to equal zero at age 20.) In the cohorts model (Table 1, lines 2-4), the Rococo group yields significant parameter estimates, but the Neoclassical group does not. This is borne out by a look at Figure 2, where the earlier cohort has a clear peak at about age 50, whereas the profile for the later cohort is quite flat and gently concave, with a peak in the late 30's. However, with the low precision in the parameter estimates for the second cohort, we cannot reject the null hypothesis that the two age-valuation profiles are identical.

Table 1[5]

Estimates of hedonic regression parameters:
quadratic polynomials in age, by cohort

Cohort	Age	Age^2	Wald statistic, χ^2_2 (p-value)
All artists	0.023	-2.44$\times 10^{-4}$	10.8
	(0.0084)	(7.74$\times 10^{-5}$)	($p < 0.01$)
b. pre-1735	0.029	-2.94$\times 10^{-4}$	14.1
	(0.0098)	(8.13$\times 10^{-5}$)	($p < 0.01$)
b. 1735 and after	0.013	-1.65$\times 10^{-4}$	1.80
	(0.016)	(1.61$\times 10^{-4}$)	($p = 0.41$)
null of coef. equality			0.99
			(p=0.61)

Another way of examining shifts over time, as opposed to the division into two cohorts, is a specification in which the coefficients of the quadratic age-valuation profile are permitted to vary continuously with the year of birth (Table 2 and Figure 3). Figure 3 plots the estimated function for three hypothetical birth years, 1680, 1730, and 1780. Artists born earlier appear to peak later in life than those born later, a result which is in conformity with the hypothesis that artists that are more linear, "classical", or "conceptual" in their artistic approach tend to do better work earlier in their lives. However, although the point estimates of coefficients are such that the peaks of the profiles do appear to evolve monotonically through time, the date of birth effects are neither individually nor jointly significant.

[5]Standard errors are given in parentheses. The last line of the table provides a test of the null hypothesis of equality of coefficients across all cohorts, χ^2 under H0.

Table 2[6]

Estimates of hedonic regression parameters:
quadratic polynomials plus date of birth effects
all artists, pooled

Age	Age^2	d.o.b. × age	d.o.b. × age^2	Wald, χ^2_2 (p-value)
0.52	-0.0033	-2.9×10^{-4}	1.8×10^{-6}	
(0.56)	(0.0054)	(3.3×10^{-4})	(3.2×10^{-6})	
joint significance				2.16 ($p = 0.34$)

Overall, while point estimates in the pooled models tend to be in line with the van Mander-Galenson hypothesis, individual variation is large relative to any general trend which may be present, and the estimated differences along the dimension of birth date are well within the range that could be accounted for by sampling error.

5.2 Individual artist regressions

The estimated profiles for the 23 artists for whom we had at least 25 observations are plotted individually in the 23 different frames of Figure 4, in order of year of birth. In each case, three estimates are included: (i) the solid line indicates the estimate from the pooled model with shifting parameters for any artist born in the same year as the artist in question; (ii) the dashed line indicates the estimate for the artist using dimension reduction; and (iii) the dotted line gives the estimated profile using model averaging. All are normalized to zero at age twenty. The individual coefficient estimates on which these profiles are based, with standard errors, are recorded in the table of Appendix B. As noted, individual sample sizes are small, and coefficients are often not significantly different from zero.

For most of the artists, dimension reduction and model averaging give results that are quite similar; in a number of cases they are almost identical, and in most others they lead to similar interpretations regarding overall career trajectory. In numerous cases the individual-level profiles are rather different from what would be predicted based on the pooled model. This is to be expected, given the strong idiosyncratic character of artistic creation; individual-artist profiles such as these may indeed be of independent interest to various art market participants such as collectors, dealers, auction houses, and other experts such as art historians and art appraisers. These individual-level regressions also hold the promise of delivering more accurate predictions of the potential auction value of individual art works.

[6]Standard errors are given in parentheses. The last line of the table provides a test for the joint significance of date of birth effects, χ^2_2 under H_0.

It may be of interest, in light of the van Mander-Galenson hypothesis, to enquire as to whether individual artists whose profiles depart substantially from the pooled profiles may possess individual styles that are more or less painterly by the norms of their particular generations. First, we consider those individual profiles plotted in Figure 4 for which the dimension reduction and model averaging estimates are similar to each other, deliver peak ages substantially different from the pooled model, and for which the parameter estimates reported in Appendix B are statistically siginificant. There are two we have identified as satisfying these criteria, viz. Granet and Isabey. Granet was briefly a student of David but did not work in the predominant neoclassical style of the time. Indeed, his style was more painterly than the norm, with an emphasis on depictions of effects of light, he painted many landscapes and watercolors, and he has been seen as a forerunner of Impressionism (see Coutagne 2008 and Turner 2000). That Granet is found to peak relatively late for his cohort is as would be predicted by van Mander-Galenson. Isabey was of the same generation and specialized in portrait miniatures (Turner 2000). He was noted for his color effects and his work in watercolor, was not a neoclassicist, and thus the later peaks found in his case would also be as suggested by van Mander-Galenson. Although not statistically significant, the early peak for Kauffmann as indicated by the individual-level point estimates is also consistent with the van Mander-Galenson hypothesis, as Kauffmann was one of the first exponents of the neoclassical style, in which she started working as a teenager, at which time she was in association with neoclassical pioneers such as Gavin Hamilton and Johann Joachim Winckelmann (Roworth 1992).

From the point of view of the van Mander-Galenson hypothesis, however, the results again offer little if any evidence in favour. Leaving aside the difficulty in obtaining significant results in these small samples, there is some indication of a tendency toward earlier age-valuation peaks among later-born artists, but this tendency is modest relative to individual variation.

6 Concluding remarks

Although these data come from a period which witnessed a major artistic shift along the dimension described addressed in the van Mander-Galenson hypothesis, these results do not show substantial support for the hypothesis.

While statistical power is always a possible explanation for negative results, the aggregate sample size of over 1300 observations is sufficiently large that we would expect to see evidence of an effect if it were reasonably strong. The individual artists' samples that we treat are small, so that one could reasonably argue that even a substantial effect along the lines predicted by van Mander and Galenson might not be statistically detectable, it remains true that even leaving statistical significance aside, the point estimates of peaks in the age-valuation relation do not show a strong pattern that would conform with the hypothesis. The variation among individuals is large at each historical period within the sample, while a trend across time, if any, is so weak as to be difficult to discern.

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Figures 1-3
Age-valuation profiles:
pooled, by cohort, and with birth-date effects

Fig. 1 — Age–Valuation Profile (All Artists)

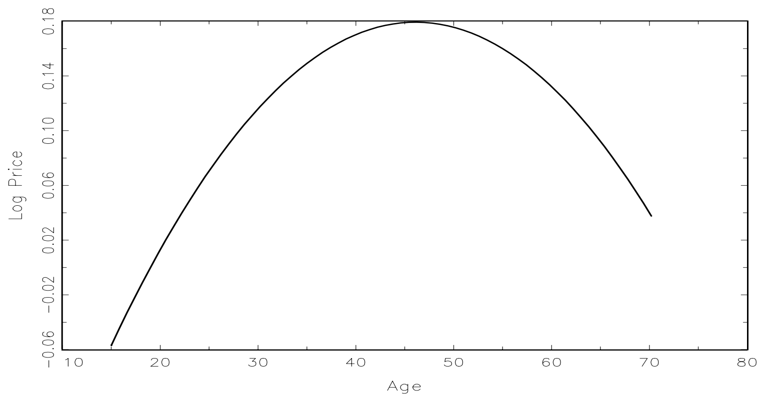


Fig. 2 — Age–Valuation Profile By Cohort,
Rococo (Solid) & Neoclassical (Broken)

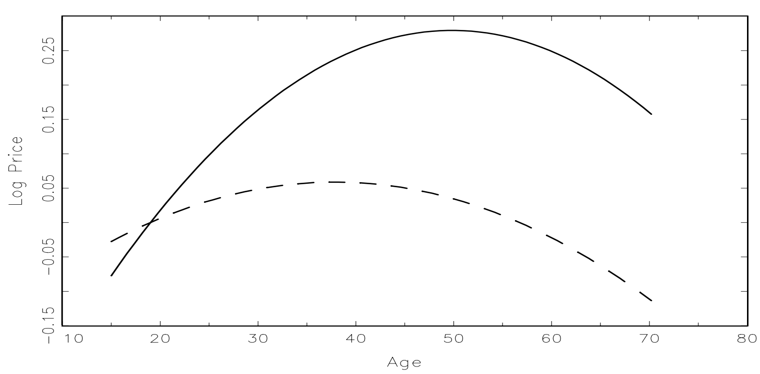


Fig. 3 — Age–Valuation Profile with Date–of–Birth Effects

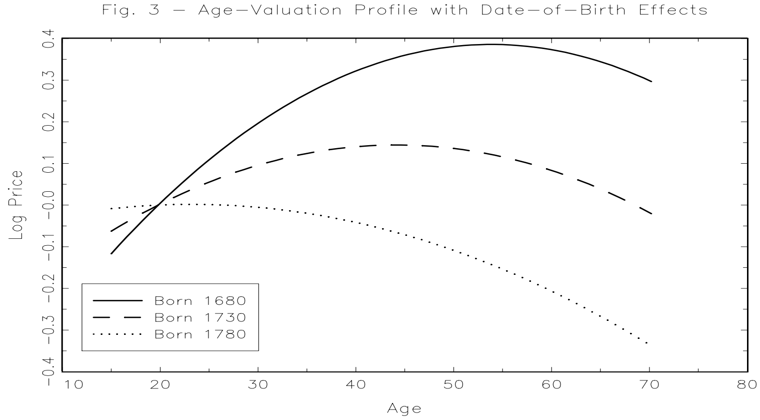


Figure 4
Individual age-valuation profiles, ordered by birth year

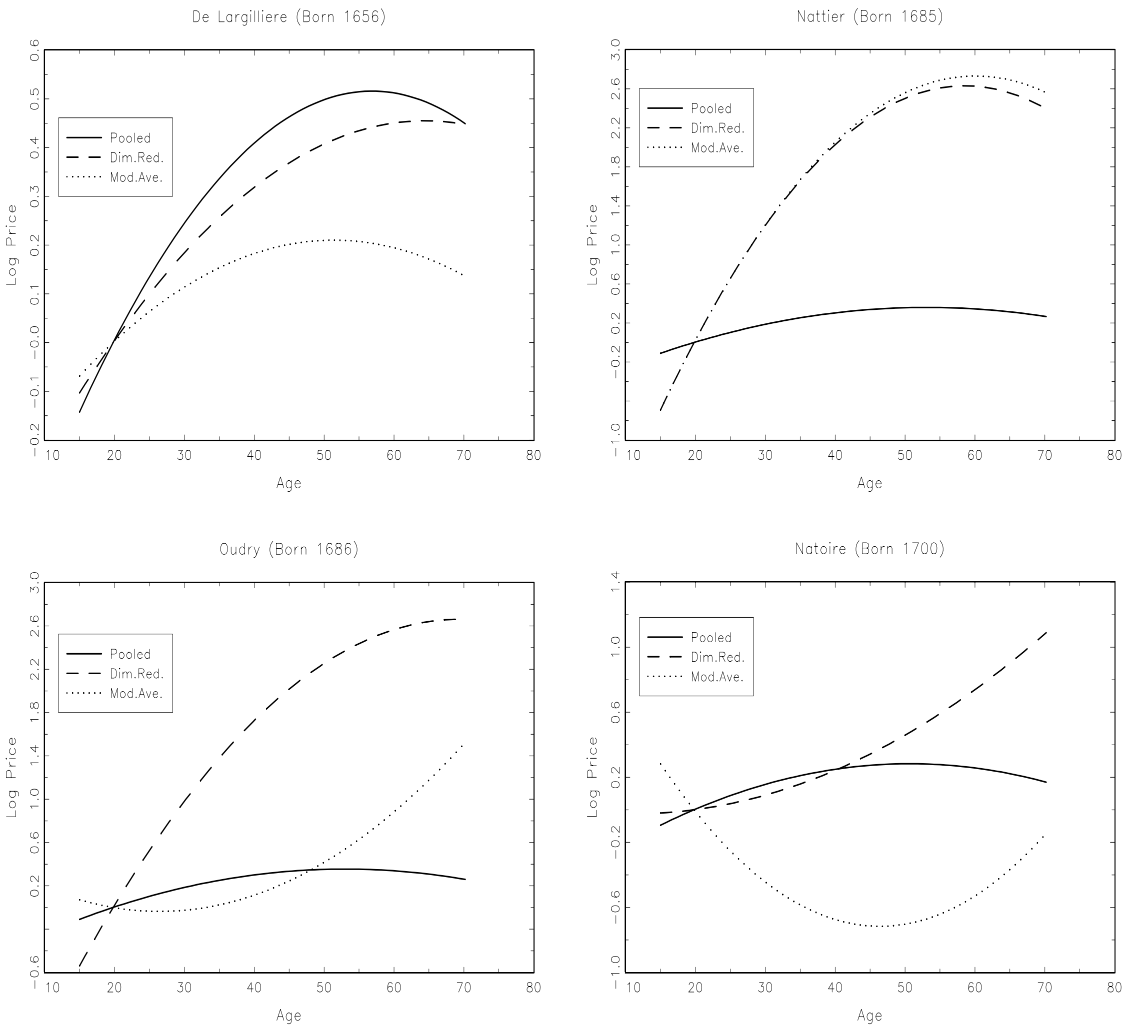


Figure 4, continued
Individual age-valuation profiles

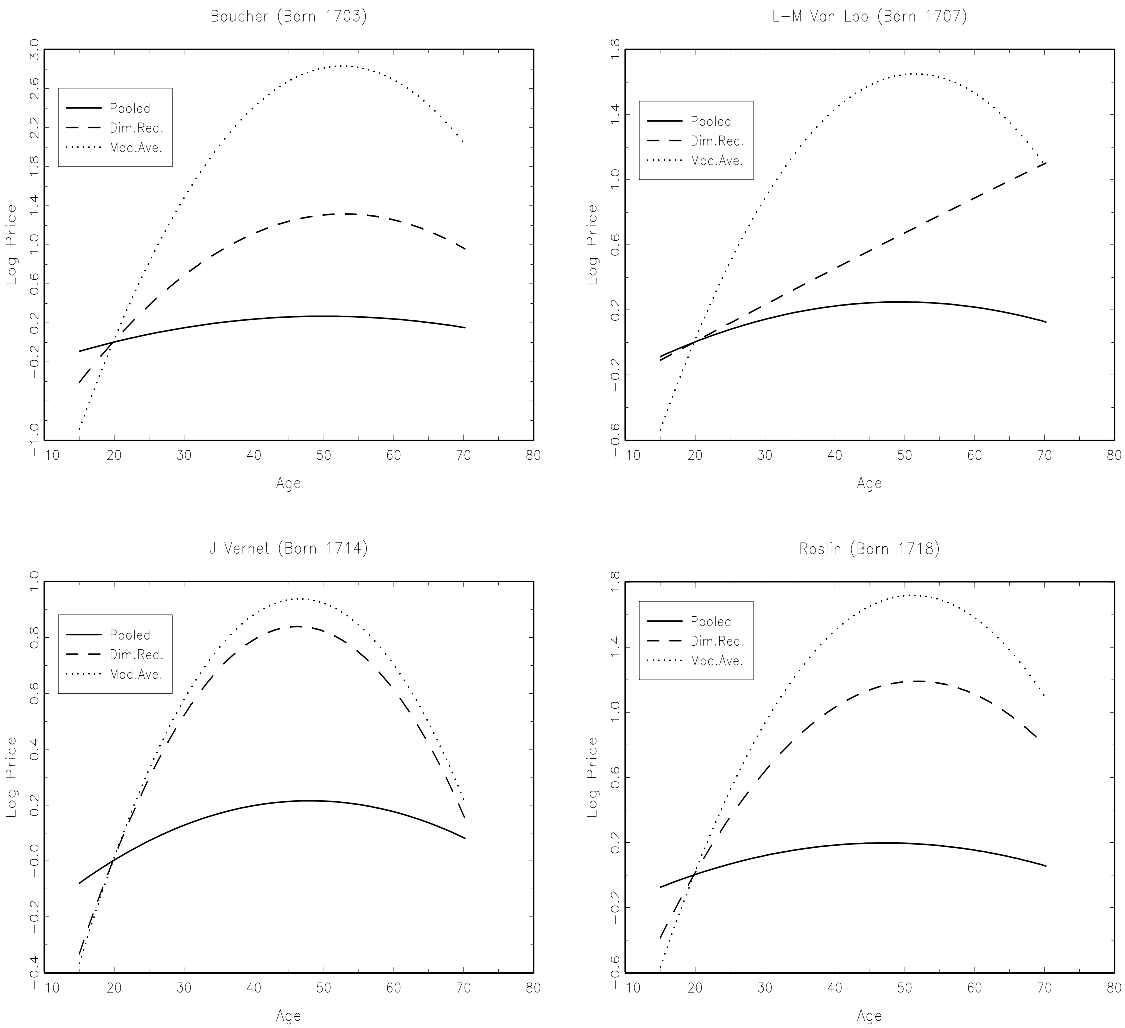


Figure 4, continued
Individual age-valuation profiles

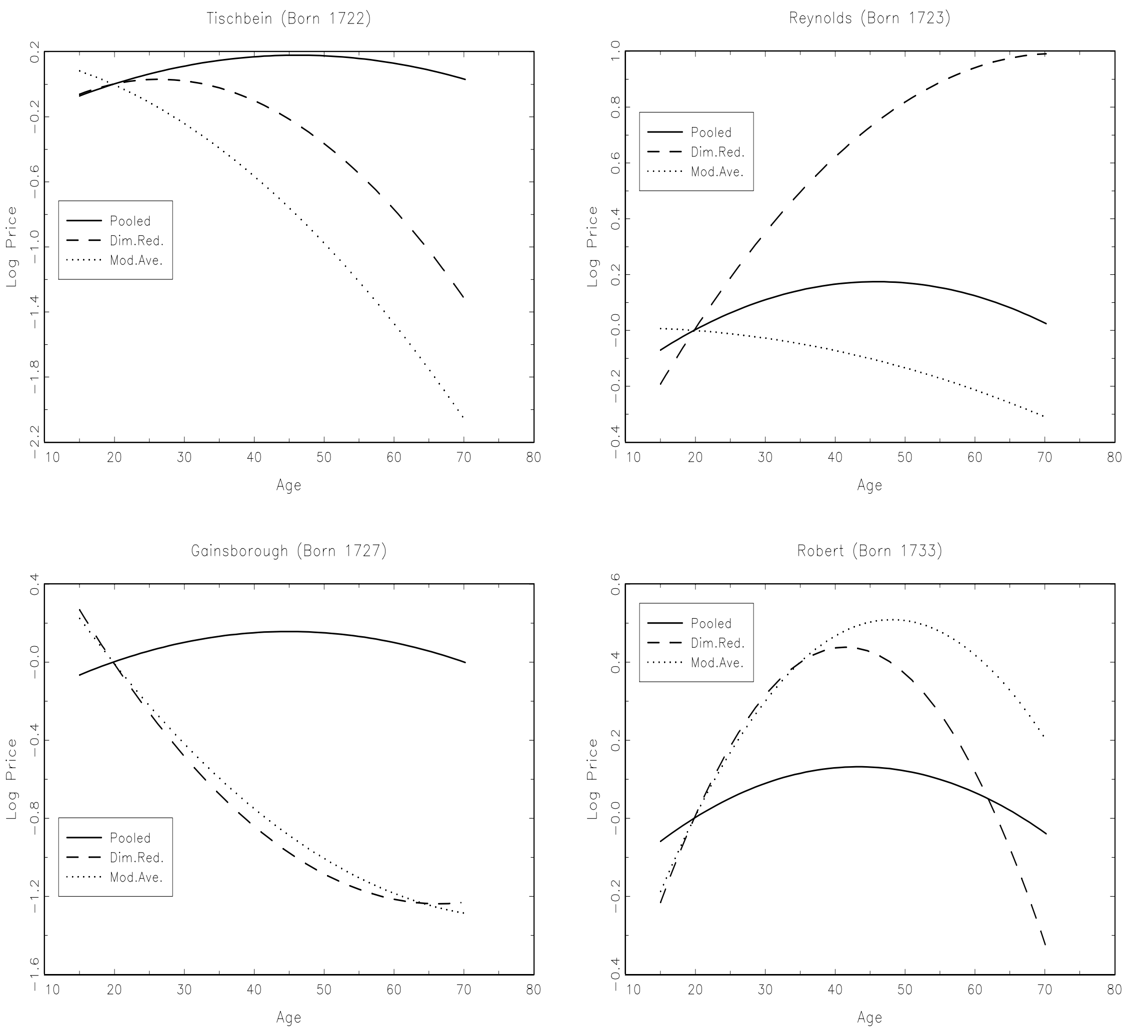


Figure 4, continued
Individual age-valuation profiles

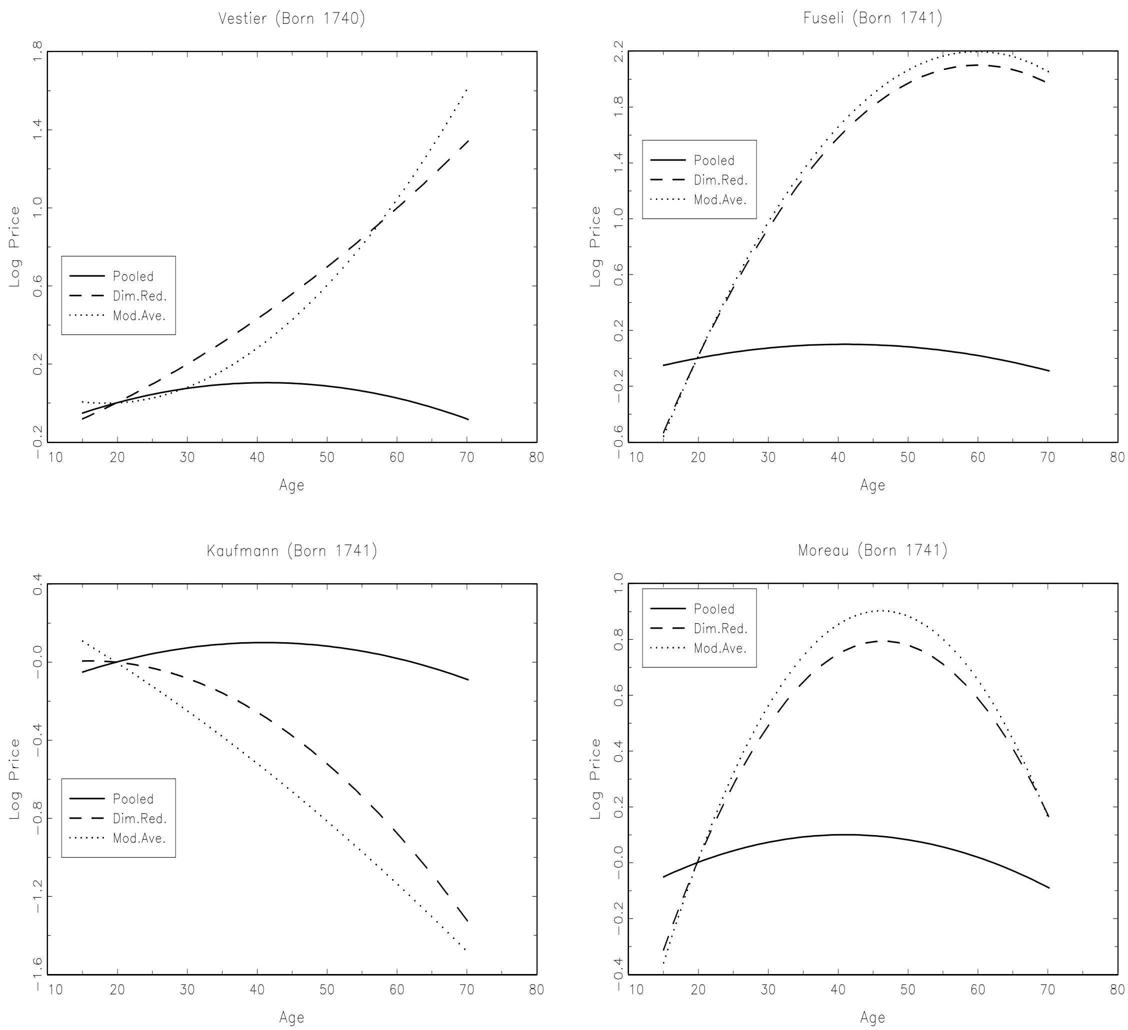


Figure 4, continued
Individual age-valuation profiles

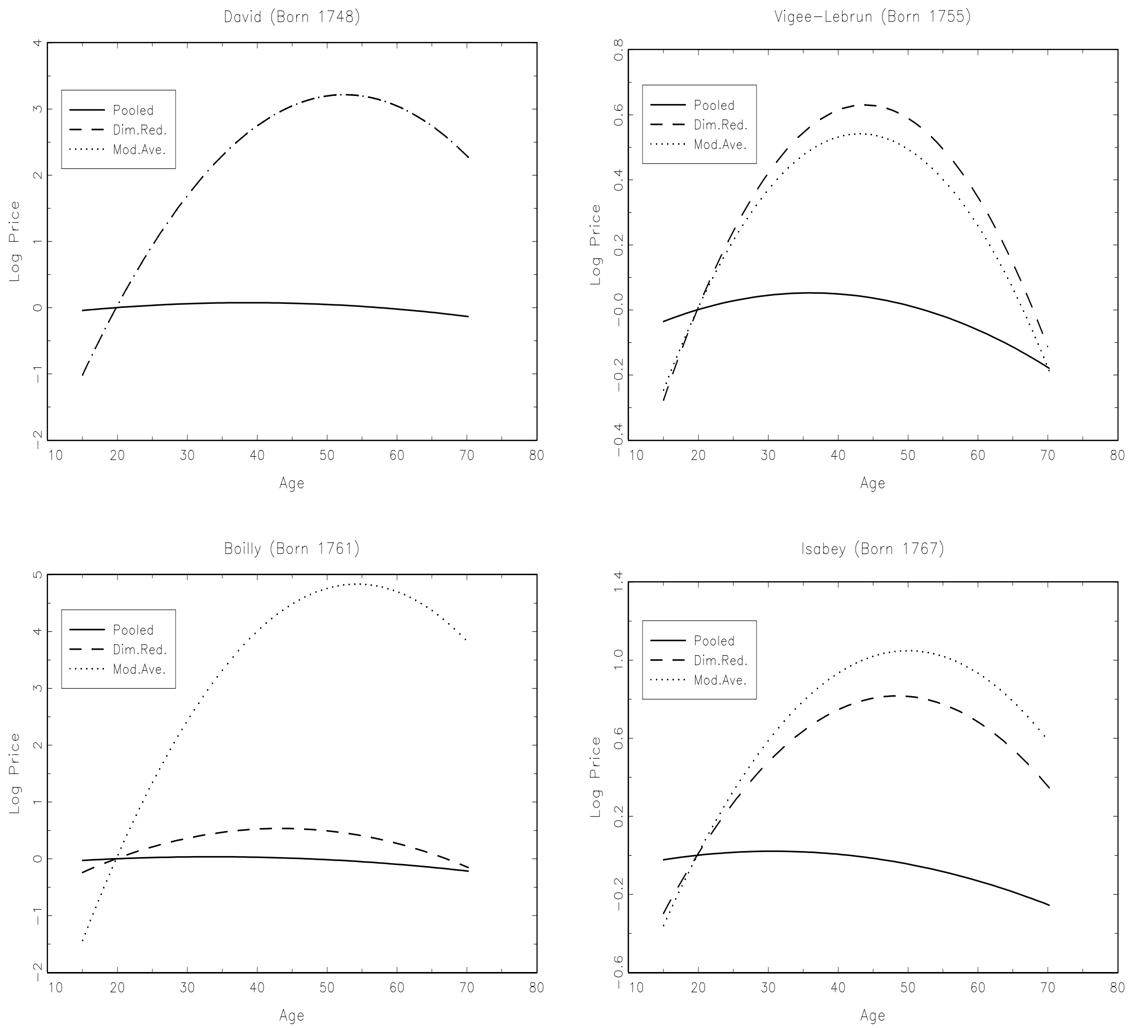
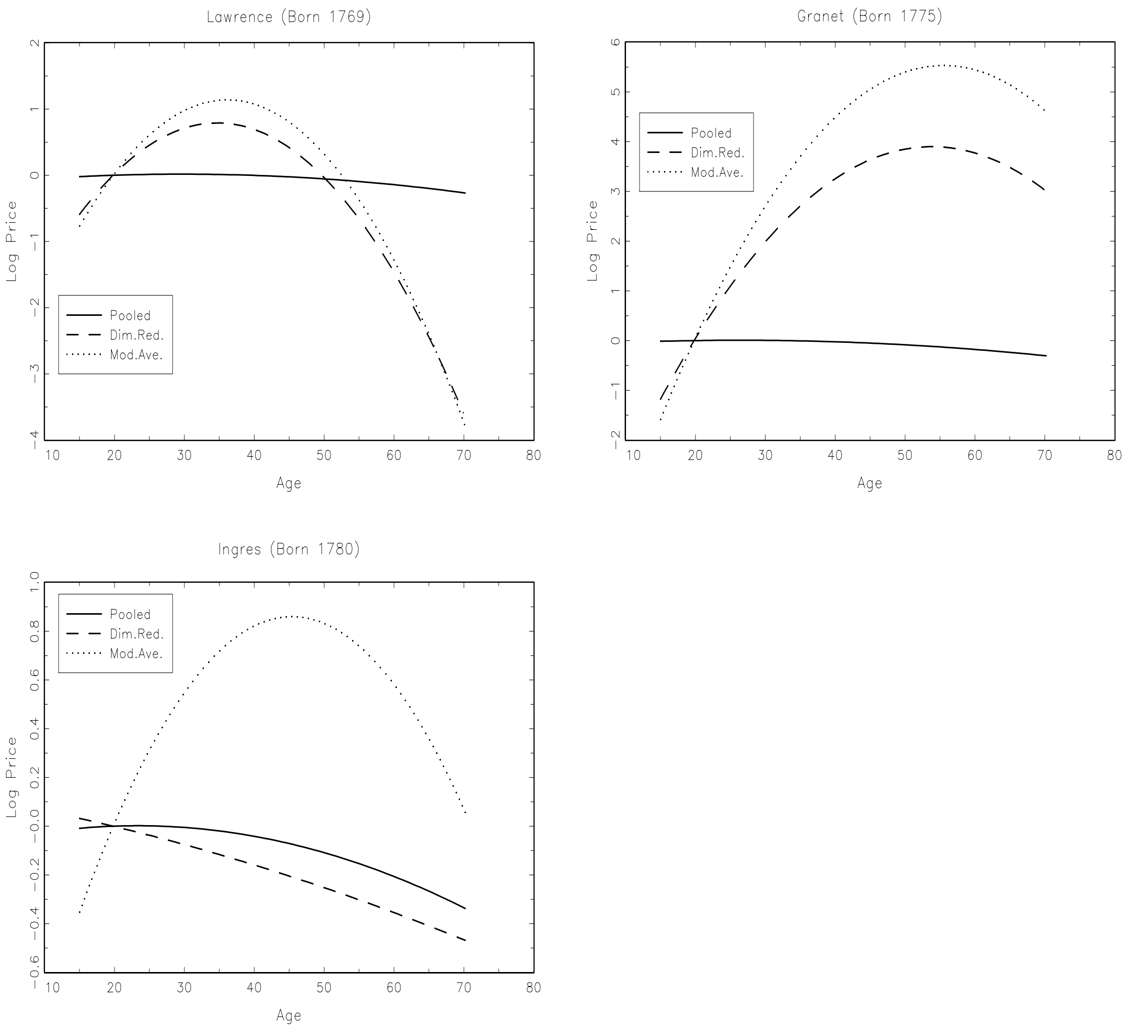


Figure 4, continued
Individual age-valuation profiles



Appendix A

List of artists included, with lifespan and number of observations

Pompeo Batoni (1708-1787, 20), Louis Leopold Boilly (1761-1845, 31), François Boucher (1703-1770, 41), Antonio Canal (Canaletto) (1697-1768, 3), Jean-Baptiste Simeon Chardin (1699-1779, 6), Sebastiano Conca (1676/80-1764, 7), Antoine Coypel (1661-1772, 5), Jacques-Louis David (1748-1825, 26), Nicolas De Larg- illiere (1656-1746, 34), François De Troy (1645-1730, 9), Jean François De Troy (1679-1752, 15), John Flaxman (1755-1826, 7), Alexandre Evariste Fragonard (1780-1850, 7), Jean-Honoré Fragonard (1732-1806, 18), Henry Fuseli (1741-1825, 28), Thomas Gainsborough (1727-1788, 28), Jacques Gamelin (1738-1803, 11), François Gerard (1770-1837, 16), Anne-Louis Girodet (1767-1824, 13), François-Marius Granet (1775-1849, 29), Jean-Baptiste Greuze (1725-1805, 12), Francesco Guardi (1712-1793, 12), Giacomo Guardi (1764-1835, 4), John Hoppner (1758-1810, 3), Jean Auguste Dominique Ingres (1780-1867, 71), Jean-Baptiste Isabey (1767-1855, 71), Angelica Kauffmann (1741-1807, 27), Thomas Lawrence (1769-1830, 26), Nicolas Lancret (1690-1743, 1), François Lemoyne (1688-1737, 2), Jean-Etienne Liotard (1702-1789, 18), Andrea Locatelli (1695-c1741, 2), Jean-Michel Moreau (1741-1814, 34), Charles Joseph Natoire (1700-1777, 27), Jean-Marc Nattier (1685-1766, 29), Jean-Baptiste Oudry (1686-1755, 66), Giovanni Paolo Pannini (1691-1765, 17), Charles Parrocel (1688-1752, 2), G.B. Piazzetta (1682-1754, 3), Jean-Baptiste Marie Pierre (1713/14-1789, 8), Pierre-Paul Prudhon (1758-1823, 9), Joshua Reynolds (1723-1792, 25), Sebastiano Ricci (1659-1734, 2), Hyacinthe Rigaud (1659-1743, 14), Hubert Robert (1733-1808, 124), Alexander Roslin (1718-1793, 40), Francesco Solimena (1657-1747, 2), G.B. Tiepolo (1696-1770, 18), G.D. Tiepolo (1727-1804, 9), Johann Heinrich I Tischbein (1722-1789, 33), Johann Heinrich William Tischbein (1751-1829, 17), Francesco Trevisani (1656-1746, 7), Carle Van Loo (1705-1765, 10), Louis-Michel Van Loo (1707-1771, 26), Carle Vernet (1758-1836, 22), Joseph Vernet (1714-1789, 78), Antoine Vestier (1740-1824, 34), Joseph-Marie Vien (1716-1809, 12), Elisabeth Vigée Le Brun (1755-1842, 36), François Andre Vincent (1746-1816, 22), Jean-Antoine Watteau (1684-1721, 1), Richard Wilson (1714-1782, 6), Joseph Wright of Derby (1734-1797, 8)

Appendix B

Individual artist coefficient estimates:
age and age^2, three estimation methods

	OLS		dimension reduction		model average	
	age	age^2	age	age^2	age	age^2
Boilly	0.11	-0.0012	0.083	-0.00096	0.44	-0.0041
-	(0.10)	(0.0011)	(0.088)	(0.00096)	(0.16)	(0.0015)
Boucher	0.20	-0.0018	0.13	-0.0012	0.28	-0.0026
-	(0.13)	(0.0014)	(0.12)	(0.0012)	(0.13)	(0.0014)
David	0.22	-0.0022	0.38	-0.0036	0.32	-0.0030
-	(0.22)	(0.0020)	(0.24)	(0.0022)	(0.23)	(0.0021)
Delargilliere	0.0058	-6.8E-05	0.029	-0.00023	0.022	-0.00021
-	(0.069)	(0.00062)	(0.066)	(0.00059)	(0.068)	(0.0006)
Fuseli	0.11	-0.00087	0.17	-0.0015	0.16	-0.0014
-	(0.12)	(0.0011)	(0.11)	(0.00097)	(0.091)	(0.0008)
Gainsborough	-0.069	0.00053	-0.077	0.00059	-0.06	0.00038
-	(0.057)	(0.00046)	(0.076)	(0.00057)	(0.071)	(0.00053)
Granet	0.51	-0.0045	0.36	-0.0033	0.48	-0.0043
-	(0.18)	(0.0016)	(0.17)	(0.0015)	(0.17)	(0.0015)
Ingres	0.15	-0.0016	0.097	-0.0011	0.12	-0.0013
-	(0.068)	(0.00063)	(0.066)	(0.00061)	(0.064)	(0.00059)
Isabey	0.055	-0.00057	0.073	-0.00075	0.12	-0.0011
-	(0.068)	(0.00067)	(0.068)	(0.00068)	(0.065)	(0.00064)
Kauffmann	0.43	-0.0051	0.037	-0.00074	-0.018	-0.00013
-	(0.17)	(0.0021)	(0.19)	(0.0022)	(0.18)	(0.0020)
Lawrence	0.24	-0.0034	0.20	-0.0032	0.31	-0.0043
-	(0.096)	(0.0013)	(0.078)	(0.0010)	(0.093)	(0.0012)
Moreau	0.12	-0.0013	0.10	-0.0011	0.12	-0.0013
-	(0.11)	(0.0012)	(0.11)	(0.0012)	(0.11)	(0.0012)

Appendix B, continued

Individual artist coefficient estimates:
age and age^2, three estimation methods

	OLS		dimension reduction		model average	
	age	age^2	age	age^2	age	age^2
Natoire	-0.015	0.0004	-0.011	0.00042	-0.094	0.0010
-	(0.16)	(0.0015)	(0.18)	(0.0016)	(0.17)	(0.0015)
Nattier	0.21	-0.0017	0.21	-0.0018	0.20	-0.0017
-	(0.12)	(0.0012)	(0.12)	(0.0012)	(0.12)	(0.0012)
Oudry	0.0037	0.00041	0.10	-0.0007	-0.043	0.00082
-	(0.085)	(0.00092)	(0.088)	(0.00095)	(0.082)	(0.00088)
Reynolds	0.054	-0.00039	0.052	-0.00036	0.0016	-8.7E-05
-	(0.14)	(0.0014)	(0.15)	(0.0015)	(0.11)	(0.0012)
Robert	0.023	-0.00019	0.066	-0.00076	0.061	-0.00064
-	(0.051)	(0.00055)	(0.044)	(0.00048)	(0.048)	(0.00052)
Roslin	0.13	-0.0012	0.12	-0.0012	0.18	-0.0018
-	(0.14)	(0.0014)	(0.15)	(0.0014)	(0.14)	(0.0013)
Tischbein	0.068	-0.0012	0.037	-0.00071	-0.0020	-0.00043
-	(0.26)	(0.0028)	(0.22)	(0.0023)	(0.25)	(0.0027)
van Loo	-0.057	0.00084	-0.0075	0.00034	0.17	-0.0016
-	(0.16)	(0.0017)	(0.17)	(0.0018)	(0.15)	(0.0016)
Vernet	-0.0020	-0.00013	0.099	-0.0011	0.12	-0.0013
-	(0.09)	(0.00086)	(0.081)	(0.00077)	(0.079)	(0.00075)
Vestier	-0.021	0.00058	0.011	0.00018	-0.022	0.0006
-	(0.14)	(0.0018)	(0.15)	(0.0019)	(0.13)	(0.0017)
Vigee	0.11	-0.0013	0.096	-0.0011	0.086	-0.0010
-	(0.070)	(0.00081)	(0.072)	(0.00084)	(0.066)	(0.00076)