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An Artistic Production Function: Theory and an Application to Australian Visual Artists

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Abstract. This paper proposes a production function for artistic output in which quantity and quality of output are specified as joint products from the inputs of labour and capital provided by individual artists. A model is constructed specifying the quantity of creative and commercial output and the quality of creative output as a function of inputs of labour time and of physical and human capital. Included in the latter is a variable to account for the contribution of creative talent to an artist's human capital. The model is estimated for a sample of practising professional visual artists and craftspeople in Australia. The results suggest that a model along the lines indicated may be taken as a plausible representation of the artistic production process.

Key words: artistic output, creativity, production function, talent

1. Introduction

The concept of the production function as the fundamental means of explaining how the output of goods and services in the economy is produced has a long history in economics. The application of this concept to the production of artistic goods has focussed on the output of performing arts services by firms in the theatre, opera, music and dance industries, where physical output (measured, for example, as numbers of performances or numbers of seats sold) is readily observable, as are the inputs of the principal factors of production, namely different types of labour and capital. In our 1979 book (Throsby and Withers, 1979, pp. 16–18, 86–92), Glenn Withers and I built on some earlier work (Throsby, 1977) to formalise these relationships into empirically estimable production and cost functions. Subsequently, there have been some applied studies of production functions in the cultural field, including those of Gapinski (1980, 1984) and Bishop and Brand (2003). Furthermore much empirical effort has gone into estimating cost functions for artistic and cultural enterprises; these relationships of course imply corresponding production functions (Taalas, 2003).

All of the above work deals with firm-level or industry-level production functions, where the firms involved are recognisable as corporate entities formed by groups of artists, technicians, managers, administrators, etc. But many individual artists across all art forms can also be construed as small business enterprises, and

indeed a number of them become incorporated as such, supplying goods and services to particular markets. The outputs produced by these firms are either final goods and services sold to consumers, such as in the case of visual artists who market their work direct to the public, or intermediate goods, such as in the case of performing artists who sell their services to other firms (e.g., to performing companies).

Turning attention to the production processes of individual artists implies taking a different approach to the analysis of artistic behaviour from that which has been taken to date. Most studies of artistic behaviour that have appeared in the economics literature have been framed in terms of artists supplying their labour to the artistic labour market (for example, Wassall and Alper, 1992; Throsby, 1994; Cowen and Tabarrok, 2000; Rengers and Madden, 2000; Robinson and Montgomery, 2000; Caserta and Cuccio, 2001; Abbing, 2002). However, construing artists as small businesses supplying goods and services for sale shifts the focus from artists as workers to artists as producers. In this paper I take this alternative approach to looking at the production of art, suggesting a form for an artistic production function at the single-person-firm level and estimating it using recent Australian survey data.

2. Artistic Production

Two important features of artists as business enterprises that distinguish them from other firms in the economy are, first, that creativity is an essential input into their production processes (Bryant and Throsby, 2006) and, second, that the primary incentive to innovation is likely to be non-financial. The first of these suggests that there will be some differences from ordinary firms in the combination of factors of production used by these firms and in their productivity; labour, for example, cannot be specified as a homogeneous input. The second indicates that decision processes of the firm will place particular emphasis on quality characteristics of the firm's output, to the point where quality may be a joint or sole maximand in the firm's utility function. Bearing these considerations in mind, we can propose a production function for such firms in which quantity and quality of output are joint products produced from conventional inputs of labour and capital. The labour input can be interpreted straightforwardly as being the time the artist spends at creative work. The capital input in this production function comprises both material and human capital; the material or operating capital is seen in the equipment and supplies needed for painting pictures, playing music, etc., while the human capital component captures not just the usual ingredients that are enhanced by education and experience, but also the specific characteristic of the artist that could be termed creativity or talent. It is not unreasonable to propose that, just as there are varying levels of educational qualifications or length of experience, so also are there likely to be varying degrees of creativity. The level of a given artist's creativity might

range from the more or less routine creativity of lesser artists to the highest levels of creative genius – artists whose innovations might change the course of history in their art form.[1] In this context the term creativity might be thought of as being, if not synonymous with, at least closely related to, the notion of talent.

In proposing a specific form for the artistic production function outlined above, we begin by noting that artists are generally unable to make sufficient return from their primary creative work on which to survive and are obliged to seek other income-earning opportunities. It has been observed that they frequently prefer to find such opportunities within the arts rather than outside. For example, a common arts-related activity that artists take on as a second job is teaching within their art form, such as a musician taking private pupils or a visual artist giving classes in an art school. Such activities require use of artistic skills, but the degree of "creativity" required to produce the associated output is presumably less than that involved in producing original primary creative work.[2]

We can therefore specify, for a given artist, two types of output within the arts, each with its own production function. The first is creative artistic output – the novels, the poetry, the paintings and sculptures, the live performances in acting, dancing, music-making, etc. that characterise the essential originality of the artist's work. The second might be called commercial artistic output, where production uses artistic skills but at a more routine and commercially-oriented level. Both production functions contain the following inputs: labour time allocated to the respective activities; working capital; and human capital characteristics, including education, training, experience and artistic creativity or talent.

As noted earlier, the artistic production function being proposed here purports to explain both quantity and quality of output. We assume that explaining output quality is relevant in the case of creative output only; quality of creative output is assumed to be determined as a function of the same explanatory variables as for quantity of output, though we would expect the different variables to have different effects in each case, as discussed further below.

Formally, we can define for a given time period for the j-th artist ($j = 1, \ldots, n$):

$$y_j^{cr}, q_j^{cr} = f_1\left(L_j^{cr}, PK_j^{cr}, HK_{ij}\right) \tag{1a}$$

$$y_j^{co} = f_2\left(L_j^{co}, PK_j^{co}, HK_{ij}\right) \tag{1b}$$

where y = quantity of output; q = output quality; L = labour input; PK = input of physical capital; HK_i = vector of human capital characteristics (i = 1,. . . ,m); and where the superscripts *cr* and *co* denote creative and commercial artistic production respectively.

3. Application

To estimate such a set of production functions for a given artist or group of artists requires the specification of variables which present formidable difficulties of

measurement. Despite this, some progress can be made if sample survey data of sufficient detail are available. In this paper I use data for a nationwide sample of approximately 360 visual artists (including craftspeople) taken from a recently completed survey of practising professional artists in Australia (Throsby and Hollister, 2003).

In the following paragraphs the specification of variables for the production functions is outlined. Note that the time period covered is the financial year 2000-01 and that monetary quantities are measured in Australian dollars ($A).[3] Fuller details of the variables measured are given in the Appendix to this paper.

3.1. OUTPUT VARIABLES

(a) *Quantity of output:* In the production functions for the performing arts referred to earlier, the measurement of output in physical terms was feasible (number of performances presented by the firms over a given period, etc.). In the case of individual visual artists, a quantitative measure of physical output is much more difficult to specify. It makes little sense, for example, just to count up numbers of paintings produced, exhibitions mounted, etc. Indeed the only practicable way to represent the quantity of output is in terms of a market valuation over the time period considered. Monetary measures have been widely used in representing output for firms and industries in many empirical studies of production functions in economics when non-homogeneous products are involved. Of course such a measure implies something about the uniformity of prices received by firms in a given industry, a proposition much more tenable in the wheat industry, say, than in the visual arts. Nevertheless, there are sufficient precedents for using a value measure for output in estimating production functions across disparate products and firm types to provide a modicum of comfort for the use of this assumption here, despite its obvious shortcomings.

In the empirical estimates reported below, we specify original *creative* output as the gross income received from the artist's primary creative practice in the given year ($A), and *commercial* output as the gross income received from arts-related activities in the same period ($A).

(b) *Quality of output:* Evaluation of the quality of output is difficult for any type of product, and is particularly problematic in the arts, given the enormous array of characteristics of most cultural goods and services. Indeed many of these characteristics may be unquantifiable in anything other than highly subjective terms. Nevertheless it may be possible to use independent evidence on the level of an artist's professional standing as a means of assessing the quality of that artist's work. In the survey, respondents were asked to indicate their artistic achievements over the past five years. For visual artists and craftspeople, a total of 20 options were specified covering a wide range of possible achievements (Throsby and Hollister 2002, p. 136). From these, we can identify three which indicate a distinctive degree of excellence in the artist's work. These are:

- Had a one-person show at a major gallery (public or commercial)[4];
- Had a work or works selected for exhibition at a major gallery;
- Had a work purchased or commissioned by a public gallery or institution.

Respondents were also asked to nominate which one out of the range of 20 options they regarded as their *most important* achievement. Artists nominating one from the above list could be seen as having achieved particular recognition by their profession.

In addition there is one further piece of external evidence on the quality of an artist's output. Respondents in the survey were asked whether in the last five years they had received a grant to support their creative work from a funding body such as the Australia Council (the Australian federal government's arts funding body) or a State arts agency. These grants are peer assessed according to strictly controlled procedures and are awarded for high-quality artistic activity. Thus receipt of a grant is a clear recognition of quality in the recipient artist's work.

Putting all of these pieces of information together enables the construction of a composite indicator which, under certain conditions, can stand as a proxy for artistic quality. Assigning a zero-one value to each of the five items above and then calculating an unweighted sum yields a score for each artist ranging from zero to 5 that can be called an "output quality indicator", where higher values will be associated with a greater accumulation of high quality work.[5] Of course, to represent this score as a cardinal scale implies a number of assumptions concerning, for example, equal weight attaching to each item, etc. Accordingly in the analysis below this variable is also condensed into a dummy variable (high/low quality) as a means of avoiding these strong assumptions.

3.2. INPUT VARIABLES

(a) *Labour*: This is specified as the mean hours per week devoted to primary creative work and arts-related work respectively in the given year.

(b) *Operating capital*: The survey recorded the artist's estimate of the expenses incurred in pursuing his/her creative practice in the given year ($A). No separate estimate is available of the costs incurred in producing commercial output, and so the operating capital variable has to be omitted from the commercial output equation. In other words, we attribute the recorded expenses to the creative output only, although we acknowledge that in fact there is likely to be some overlap in working capital expenditures with the production of commercial output.

(c) *Human capital 1 – general education:* This is measured as the highest level of general (non-arts) education achieved, specified as a dummy where post-secondary = 1, zero otherwise.

(d) *Human capital 2 – arts training:* This is specified as the number of years spent training to obtain basic and higher qualifications to practise professionally as a visual artist or crafts practitioner (years).

(e) *Human capital 3 – experience:* Proxied as age (years).

(f) *Human capital 4 – creativity:* Not surprisingly the incorporation of creativity or talent as an explanatory variable in a production function such as this presents considerable difficulties of measurement. Although there do exist tests in psychology and elsewhere that purport to measure individual creativity, no such data exist for our sample of artists. However, there is one group of questions in the survey the answers to which can be used as possible indicators of creativity. As part of the survey, artists were asked to nominate which factors had been significant in advancing their creative careers over time and at present. Options included their arts training, their talent, a "lucky break", support of family and friends, and so on. In addition, respondents were asked which one of the nominated factors had been *most important* in advancing their professional development as an artist. Among the possible options from which they could choose, two were especially relevant to creativity. First, artists nominating "my talent" could be thought of, on a self-evaluation basis, as indeed being more than usually talented, sufficiently so to persuade them to single this out as a factor in contributing to their artistic achievement. Second, it is known from studies in psychology that creative individuals tend to emerge from family backgrounds that are supportive of creative talent (Albert, 1994; Runco, 1999), perhaps because creativity is an inherited trait that is easily detected and developed within a supportive family environment.[6] Thus those artists in our survey who indicate family support as a positive factor in their professional development might be construed as being more creative than other artists.

The above considerations enable us to identify four separate criteria that can contribute towards a measure of creativity for the artists in the survey sample, namely:

- Talent identified as one factor contributing to artistic development;
- Talent identified as the most important factor;
- Family background identified as one factor contributing to artistic development;
- Family background identified as the most important factor.

In addition, a further self-assessed indication of creative talent lies in whether or not artists have sufficient confidence in their creative ability to apply for a peer-assessed grant. This item of data is available for respondents in the survey.

Assigning a zero-one value to these five factors and computing an unweighted sum across them enables an individual index of "creative talent" ranging from zero to 4 to be specified for each artist.[7] It is recognised that this is a self-assessment that is extremely crude; however, for the purposes of this analysis we accept it as a broadly acceptable means of distinguishing more talented artists from the rest.[8]

How does this composite variable compare with that derived earlier to indicate output quality? Variables that stand as proxies may always be seen as imperfect substitutes for the real but unknown quantity being measured; a given quantity may

be proxied by more than one indicator, and a given indicator may serve to represent more than one quantity. So, for example, in the present case a one-person show at a major gallery could be seen as a peer judgement on an artist's creativity, or the self-assessment of an artist as being talented may stem from the award of a one-person show. Nevertheless the approach used here can be defended on the grounds that the quality variable as we have constructed it is essentially externally assessed while the creativity variable reflects intrinsic factors influencing the artist's work. The causal relationship as postulated then falls into place: higher levels of creative talent as defined will be expected to lead *ceteris paribus* to higher quality output.

3.3. FUNCTIONAL FORM

Three functions are proposed for this analysis, two for output quantity and one for quality. The output quantity equations express creative artistic output and commercial artistic output respectively as functions of the inputs listed above, but omitting physical capital from the commercial output equation for reasons noted earlier. The output quality equation expresses the quality variable defined above as a function of the same inputs. A variety of functional forms could be called upon in the estimation of these functions, each implying certain underlying assumptions about the structure of the production relationships under study. Perhaps the most obvious is a Cobb-Douglas-type function, where estimation can be by least-squares regression on the logarithms of the relevant variables[9], provided the usual assumptions are satisfied. In the case of the quality equation when the dependent variable is specified as a zero/one variable, a logit estimation is appropriate.[10]

3.4. HYPOTHESES

The following four hypotheses are put forward as a basis for interpreting the estimated functions:

Proposition 1 *Creative talent will be a significant determinant of both the quality and quantity of creative output, but a less significant determinant of the quantity of commercial output.*

Proposition 2 *Because of the uncertainties surrounding the production of creative output, the productivity of labour time is likely to be greater in the production of commercial output than in the production of creative work. In other words, it is likely to be easier to produce more commercial output by working harder than it will be to produce more creative output by working harder.*

Proposition 3 *Creative talent is likely to be a more significant determinant of quality of output than is hard work.*

Proposition 4 *Human capital variables other than creativity are likely to play a role in the production of both creative and commercial output. They are likely to be*

of lesser importance than creativity in determining quantity and quality of creative output, but of greater importance than creativity in determining the quantity of commercial output.

3.5. RESULTS

The two output equations and the quality equation with the dependent variable specified in numerical terms were initially estimated using OLS. However the Jarque-Bera test indicated non-normality in the residuals and the Koenker statistic for the creative output and quality equations indicated the presence of heteroscedasticity. Accordingly all three equations were re-estimated using generalised least squares; given the large sample sizes and the fact that the fitted equations are not intended to be used for prediction, the re-estimated equations can be taken as satisfactory for our present purposes of inference concerned primarily with the size and significance of coefficients on the various explanatory variables in the model.

Table I gives the results for the two quantity equations estimated by GLS. The F-statistics indicate satisfactory goodness-of-fit and several important coefficients in both equations are significant, as discussed further below. Table II contains results for the quality equation, estimated first by GLS assuming a numerical dependent variable, and second as a logit estimation using a dependent variable where "high" quality (the quality indicator ≥ 3) equals 1, zero otherwise. The significance levels of coefficients from both estimations are shown in the table for purposes of comparison. The results from the two estimations in Table II are broadly comparable in terms of the relative sizes and significance levels of the coefficients; note especially that inputs of both labour time and operating capital[11] are significant determinants of output quality, while among the human capital variables both arts training and creative talent are significant at least at the 10 per cent level when quantity is measured numerically, somewhat less so when a zero/one dependent variable is used.

Let us examine the results from both tables in more detail with the aid of the above hypotheses. We note first that Proposition 1 is supported, insofar as creative talent is shown to be a significant determinant of both the quantity and (to a lesser extent) quality of creative output, whereas it is unimportant and statistically insignificant as a determinant of the quantity of commercial output. Furthermore, it is apparent that although the labour input is highly significant in both quantity functions, the productivity at the margin of an additional hour's work in producing commercial artistic output is almost twice that of an additional hour spent producing creative work. In fact Table I shows that a 10 percent increase in work time will lead to a 6.6 percent increase in commercial output, but only a 3.4 percent increase in creative output, other things being equal. This result is consistent with Proposition 2.

The evidence on Proposition 3 is somewhat difficult to interpret. Both the labour time and creativity variables do appear to exert a positive influence on artistic quality, but which is the stronger cannot be unambiguously assessed because of differences

Table I. Estimated production functions for output quantity for Australian visual artists and craftspeople, 2000–2001

Explanatory Variable	Creative output[a]	Commercial output[b]
Constant	−1.396 (−1.13)	5.431** (2.82)
Labour time[c]	0.337** (3.76)	0.664** (5.23)
Operating capital[c]	0.863** (13.76)	–
Human capital 1: general education	−0.250* (−1.68)	0.282 (1.10)
Human capital 2: arts training[c]	−0.230* (−1.95)	0.700** (2.92)
Human capital 3: experience[c]	0.444 (1.49)	0.110 (0.23)
Human capital 4: creative talent	0.116* (1.72)	−0.017 (−0.13)
n	244	111
F	51.297	9.325
Adjusted R^2	0.553	0.275

[a]Dependent variable is log of value of creative art work produced.
[b]Dependent variable is log of value of commercial (art-related) work produced.
[c]Variable measured in logs.
All logs are natural logs; t-statistics shown in parentheses; coefficients significantly different from zero at 1 percent (**) or 10 percent (*) levels; both equations estimated by generalised least squares.

in the way these inputs are measured and because of the implied cardinality assumption in the creativity variable. Nevertheless, Proposition 3 would appear to be contradicted by the results in Table II, since the labour time coefficients in both estimations are more significantly different from zero than the coefficients on creative talent. More importantly, the standardised (beta) coefficients in the GLS equation and the weighted elasticities (marginal effects) in the logit equation[12] all suggest a stronger influence for labour time than for creativity in affecting output quality, contrary to Proposition 3.

Finally, in regard to the human capital variables taken as a whole, the results support Proposition 4 only partially. It is true that creativity is more important in increasing the quantity of creative output than are the education and arts training variables and of lesser importance than other human capital variables in determining commercial output. However, education and training have negative effects on creative output rather than the zero or positive effects implied by Proposition 4. This is an odd result; it is somewhat anomalous to suggest that artists who are more highly trained or better educated actually produce less creative output in quantitative terms than their less well-qualified counterparts. A possible explanation could

Table II. Estimated production functions for output quality for Australian visual artists and craftspeople, 2000–01

	GLS estimation[a]		Logit Estimation[b]	
Explanatory variable	Coefficient	Significance	Coefficient	Significance
Constant	−3.780* (−2.60)	0.010	−8.610** (−3.62)	0.000
Labour time[c]	0.240* (2.31)	0.022	0.299* (1.71)	0.087
Operating capital[c]	0.291** (3.93)	0.000	0.438** (3.61)	0.000
Human capital 1: general education	−0.027 (−0.15)	0.881	−0.104 (−0.39)	0.699
Human capital 2: arts training(c)	0.370** (2.61)	0.009	0.352 (1.56)	0.119
Human capital 3: experience[c]	0.389 (1.13)	0.260	0.610 (1.13)	0.257
Human capital 4: creative talent	0.147* (1.83)	0.069	0.188 (1.52)	0.128
n	284		284	
F	8.229		–	
Adjusted R^2	0.133		–	
Log likelihood	–		−164.89	
Maddala R^2	–		0.116	
Cragg-Uhler R^2	–		0.160	

[a]Dependent variable is quality indicator expressed as numerical variable.
[b]Dependent variable is quality indicator expressed as zero/one variable (see text).
[c]Variable measured in logs.
All logs are natural logs; t-statistics shown in parentheses; coefficients significantly different from zero at 1 percent (**) or 10 percent (*) levels.

be that better-trained artists concentrate more on quality than on quantity of output, and indeed the quality equations do confirm an association between quality and training. However such an explanation is speculative at best and would need more detailed investigation. Meanwhile, it can certainly be concluded that arts training in this analysis emerges as a significant positive determinant of *commercial* output, a result consistent with earlier work (e.g., Throsby 1996) which has shown a strong relationship between arts training and the arts-related earnings of artists.

4. Conclusions

In this paper we have proposed a production function for artistic output where quantity and quality of output are specified as joint products from the inputs of labour and capital provided by individual artists. The study is based on the proposition that many artists can be construed as small business firms, whether or not they are

incorporated; if it is valid to see artists in this way, their production processes should be amenable to analysis using production function methods. The model constructed here specifies two types of artistic output, creative and commercial, and inputs of labour and physical and human capital. In regard to the latter, in addition to the conventional elements of human capital that might be identified such as levels of education and experience, we add a variable called "creative talent" in an effort to capture the original, spontaneous and innovative character of creative artistic work.

Our efforts to estimate this set of functions for a sample of visual artists have identified some special features of artistic production, in particular the role of creativity. The results reported here do suggest that a model along the lines indicated in this paper may be taken as a plausible representation of the artistic production process, although a lot more work needs to be done to refine both specification and measurement issues associated with this model.[13] Indeed, it has to be acknowledged that any effort in this area is seriously compromised by problems of specifying and measuring some of the model's critical variables. Four such difficulties are highlighted in the present paper. First, the use of value of output as an indicator of output quantity is obviously subject to qualification on account of price effects which cannot reasonably be controlled for. Second, as in any other field, the measurement of quality of output is problematical. Our suggestion of a composite indicator of externally-judged output quality may be one possible approach, which at least has the merit of being based on independent evaluation. Third, creativity itself is a tricky concept in this applied context. Perhaps it could be best represented by some form of individual creativity assessment derived from psychological testing, although finding such data for a group of artists would presumably require a purpose-built study. For our needs, the incorporation of the creative talent variable as specified above is a very crude approximation, although it does perform reasonably well in the results reported here. Finally, there may be dynamic effects that are not captured in the static form of this model; in particular there may be feedback effects from output quantity and quality that influence input levels in subsequent periods, complicating the simple causal relationships as specified in the static model.

In conclusion, I suggest that the line of research initiated in this paper holds promise of further theoretical and empirical development. But in doing so I stress that this line of enquiry should not be seen as superseding or replacing labour market studies in the arts. On the contrary, I would see work on artistic production as being highly complementary to the illuminating and productive work on artistic labour markets that undoubtedly will continue.

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Appendix

Data used in this paper were drawn from the full dataset for the nationwide random-sample survey of Australian artists reported in Throsby and Hollister (2003). The creative talent and quality variables as constructed in this paper are shown in the following table:

Creative talent			Quality		
Indicator value	No.	%	Indicator value	No.	%
0	31	9	0	106	29
1	78	22	1	56	16
2	116	32	2	68	19
3	101	28	3	70	19
4	36	10	4	43	12
			5	19	5
Total	362	100	Total	362	100

The descriptive statistics for all variables used are shown in the following table. Note that these data relate to the full set of valid observations available on each variable; missing observations for some variables restricted the complete set of valid observations available for the regressions to a subset of varying size for the different estimations.

Variable	Min	Max	Mean	S.D.
Creative output ($A′000)	0	313.5	14.8	31.5
Commercial output ($A′000)	0	70.0	6.2	12.5
Quality (indicator)	0	5.0	1.8	1.6
Creative labour time (hrs. per week)	0	90.0	25.4	18.4
Commercial labour time (hrs. per week)	0	99.0	7.5	12.4
Operating capital ($A'000)	0	286.9	11.9	24.2
General education (dummy)	0	1.0	0.5	0.5
Arts training (years)	0	15.0	4.7	2.8
Experience measured as age (years)	22.5	70.0	47.2	11.2
Creative talent (indicator)	0	4.0	2.1	1.1

Notes

1. The term “genius” is a contested one in contemporary sociology, though its use is still current in wider contexts; for discussion of creative genius in the arts, see Etlin (1996) Ch. 2.

2. Of course the distinction between "creative" and "commercial" as defined here is by no means theoretically watertight, with some activities such as commissioned portraits perhaps falling somewhere in between. In the empirical work reported below, however, the allocation of time between "creative" and "arts-related" (i.e., commercial) is as specified by the artists themselves according to their particular circumstances.
3. In the year under study the mean exchange rate was approximately $A1= $US 0.54.
4. The meaning of the terms "major", "public", "recognised", etc. are well understood in the Australian visual arts and crafts sector to denote a high standard of professional quality.
5. For a tabulation of this variable, see Appendix.
6. Of course an artistically-oriented family may push children towards an artistic career even if they are untalented, just as highly creative individuals might emerge from families hostile to artistic aspirations. Nevertheless the research evidence cited suggests that the relationship postulated here, even though imperfect, does indeed exist, making this variable a plausible if not ideal contributor to compiling an indicator of creativity.
7. Note that 4 is the maximum score possible for any individual, since only one of the two characteristics talent and family background can be nominated as "most important".
8. For a tabulation of this variable, see Appendix. It might be noted that what comprises creativity is also a social construct; assessment of individual creativity according to socially-determined criteria might be expected to lead to somewhat different results from the self-assessment methods employed here.
9. In these models there is no *a priori* reason for expressing the arbitrarily-scaled variables for quality and creative talent as logarithms; hence these variables are not expressed as logarithms in the empirical estimations discussed below.
10. The joint production of the three outputs specified in this model might suggest estimation by systems methods. However, efforts along these lines have proved so far unsuccessful; hence the results presented here for the equations estimated independently should be seen as just a first step towards uncovering the relationships under study.
11. This result for the visual arts may be compared with quality judgements in areas of the performing arts such as theatre and opera, where more expensive costumes, sets, etc. are sometimes seen as indicators of a higher quality production.
12. The relevant coefficients are 0.139 and 0.105 for labour time and creativity respectively in the GLS equation, and 0.538 and 0.234 respectively in the logit equation.
13. It might also be noted that equally plausible alternative models of artistic production could be developed, including approaches involving qualitative rather than quantitative measurement.

References

Abbing, H. (2002) *Why Are Artists Poor? The Exceptional Economy of the Arts*, Amsterdam University Press, Amsterdam.

Albert, R.S. (1994) "The Contribution of Early Family History to the Achievement of Eminence", in Nicholas Colangelo and Susan Assouline (eds.), *Talent Development*, Ohio Psychology Press, Dayton, pp. 311–360.

Bishop, P. and Brand, S. (2003) "The Efficiency of Museums: a Stochastic Frontier Production Function Approach", *Applied Economics* 35 (17): 1853–1858.

Bryant, W.D.A. and Throsby, D. (2006) "Creativity, the Economy and the Behaviour of Artists", in Victor Ginsburgh and David Throsby (eds.), *Handbook of the Economics of Art and Culture*, North-Holland, Amsterdam forthcoming.

Caserta, M. and Cuccio, T. (2001) "The Supply of Arts Labour: Towards a Dynamic Approach", *Journal of Cultural Economics* 25 (3): 185–201.

Cowen, T. and Tabarrok, A. (2000) "An Economic Theory of Avant-garde and Popular Art, or High and Low Culture", *Southern Economic Journal* 35 (2): 232–252.

Etlin, R.A. (1996), *In Defense of Humanism: Value in the Arts and Letters*, Cambridge University Press, New York.

Gapinski, J.H. (1980) "The Production of Culture", *Review of Economics and Statistics* 62 (4): 578–586.

Gapinski, J.H. (1984) "The Economics of Performing Shakespeare", *American Economic Review* 74 (3): 458–466.

Rengers, M. and Madden, C. (2000) "Living Art: Artists Between Making Art and Making a Living", *Australian Bulletin of Labour*, 26 (4): 325–354.

Robinson, M.D. and Montgomery, S.S. (2000) "The Time Allocation and Earnings of Artists",*Industrial Relations*, 39 (3): 525–534.

Runco, M.A. (1999) "A Longitudinal Study of Exceptional Giftedness and Creativity", *Creativity Research Journal*, 12 (2): 161–164.

Taalas, M. (2003) "Costs of Production", in Ruth Towse (ed.). *A Handbook of Cultural Economics*, Edward Elgar, Cheltenham, pp. 152–160.

Throsby, D. (1977) "Production and Cost Relationships in the Supply of Performing Arts Services", in K. A. Tucker (ed.), *The Economics of the Australian Service Sector*, Croom-Helm, London, pp. 414–432.

Throsby, D. (1994) "A Work Preference Model of Artist Behaviour" in Alan Peacock and Ilde Rizzo (eds.), *Cultural Economics and Cultural Policies*, Kluwer Academic Publishers, Dordrecht, pp. 69–80.

Throsby, D. (1996) "Disaggregated Earnings Functions for Artists" in Victor Ginsburgh and Pierre-Michel Menger (eds.), *Economics of the Arts: Selected Essays*, North-Holland, Amsterdam, pp.331–346.

Throsby, D. and Hollister, V. (2003) *Don't Give Up Your Day Job: An Economic Study of Australian Professional Artists*, Australia Council, Sydney.

Throsby, D. and Withers, G.A. (1979) *The Economics of the Performing Arts*, Edward Arnold, London.

Wassall, G. and Alper, N. (1992) "Towards a Unified Theory of the Determinants of Artists' Earnings", in Ruth Towse and Abdul Khakee (eds.), *Cultural Economics*, Springer-Verlag, Heidelberg, pp. 247–260.