Presidents' Prize Paper

Determinants of Prices for Contemporary Art in Dutch Galleries, 1992–1998*, **

MERIJN RENGERS
ICS/Department of Sociology, University of Utrecht and Department of Art and Culture Studies, Erasmus University Rotterdam, The Netherlands

OLAV VELTHUIS
Department of Art and Culture Studies, Erasmus University Rotterdam, The Netherlands

Abstract. We analyse determinants of prices for contemporary art with the help of quantitative data. The focus is on gallery rather than auction prices in the Netherlands. We model the determinants of prices on three different levels: the work of art (size, material), the artist (age, sex, place of residence, institutional recognition), and the gallery (location, institutional affiliation, age). Our main findings are that the size and material of works of art, and the age and place of residence of the artist are strong predictors of price; that differences in size and materials partly "mask" price differences between artists; and that the variance in prices across galleries is largely explained by characteristics of the artists they represent.

Key words: art galleries, artists' incomes, art markets, hedonic models, multilevel analysis, pricing

1. Introduction

What are the determinants of prices for contemporary works of art? In this paper we address this question empirically with the help of quantitative data. Previous studies on prices for art have focused on the rate of return of investment in art objects and have compared these rates to the rate of return to other (traditional) financial portfolios. These studies construct annual or semi-annual price indexes for paintings and prints, over a period ranging from 15 (Pesando, 1993) to 200 (Buelens and Ginsburgh, 1993), or even 300 years (Baumol, 1986). The findings are that the rate of return on traditional investment portfolios exceeds the rate of return on paintings in the long run, but no consensus exists on the exact magnitude of the difference (for an overview, see Frey and Eichenberger, 1995). Implicitly these studies test the efficiency of the art market: the fact that returns on paintings are lower than on other investments, can either be interpreted as a prove of inefficiency (Pesando, 1993) or as a measure of the aesthetic utility that paintings yield on top of their monetary returns (Fase and Tol, 1994; Fase, 1996).

Our study differs from previous ones in three respects: in the first place, it focuses on the *primary* rather than the *secondary* market for art. In other words, we look at gallery prices instead of auction prices. Secondly, we analyse *determinants* of prices rather than the *rate of return* on art as an investment. The third difference concerns methodology: all empirical studies so far are based on ordinary regression analysis to estimate determinants of prices. This technique implicitly assumes that no hierarchy exists in the data. However, hierarchical clusters of factors determine prices: factors related to the work of art, the artist, and the gallery.[1] In order to do justice to this hierarchy of determinants, we use *multilevel* rather than *ordinary regression* analysis.

It has been established that the price mechanism for auctions differs considerably from the price mechanism in contemporary art galleries. At auction, supply and demand interact directly to determine prices; unless a reserve price is set which is not reached in the bidding process, the secondary market is cleared (Ashenfelter, 1989). By contrast, on the primary market, contemporary art galleries sell art by means of posted prices. These prices respond to demand and supply only indirectly, and often fail to clear the market. Therefore it is important to distinguish the primary and the secondary market when analysing determinants of prices for contemporary works of art (Rouget et al., 1991). Moreover, the primary market deserves special attention because the vast majority of the works sold will never appear on the secondary market.[2]

Due to limited availability of data and the lack of transparency of the primary market, this segment has so far been largely ignored in cultural economics. Our analysis relies on the first, and to date, only extensive data set on gallery prices and a large number of their potential determinants. The data are derived from a Dutch subsidy arrangement designed to stimulate sales on the primary art market in the Netherlands. The richness of the material (covering over 16,000 works of art sold over a period of six years by more than 2,400 artists in over 200 galleries) allows us to focus on a wide range of variables and existing explanations of price levels on the contemporary art market. Rather than starting from a rigid theoretical angle, our study explores different levels of factors influencing supply, demand and (hence) price-levels on this market.

The question we try to answer is not only relevant for the way markets work; it is also directly related to the earnings of artists and their supply of art. In other words, we deal with two different markets simultaneously. First the art market, where products (works of art) are traded and where supply and demand are the driving forces; secondly the labour market on which artists rely for their income. The functioning of these two markets does not necessarily lead to similar outcomes: works of art that are very labour intensive may sell for little, whereas quick drawings may be worth more than a reasonable hourly wage.

In the following section of the paper, we briefly discuss earlier research on price formation of works of art. In Section 3 we describe the works of art, artists and galleries in the data set. In Section 4 a number of hypotheses on supply and demand

and their potential influence on the price level is derived. Since we do not model supply and demand separately, but instead estimate a hedonic price function, this section is exploratory. In Section 5 the methods used in this paper are introduced. Section 6 presents the explanatory analysis of prices. The most striking results are that a large part of the variance in prices is explained by determinants on the level of works of art rather than artists. Furthermore, it turns out that galleries derive their price level not from their own characteristics, but from characteristics of the artists they represent. We draw a number of tentative conclusions in the last section, and suggest avenues for further research.

2. Earlier Studies

The few existing quantitative empirical studies of determinants of prices for works of art are based on auction data. In other words, these studies analyse the secondary rather than the primary market. Nevertheless, they provide a good starting point for our analysis. The studies do not start from a pre-existing economic theory like marginal cost pricing or full cost pricing, but instead estimate a hedonic price function. Bruno Frey and Werner Pommerehne's study "Why is a Rauschenberg so expensive?", for instance, uses auction data on both demand and supply factors for 100 international contemporary artists, collected by the late German journalist Willi Bongard. Frey and Pommerehne find that aesthetic judgements of experts are a main determinant of economic value: "[t]he often stated claim that the prices of works of modern art are completely unrelated to their artistic value is thus not borne out by our research. If anything, the contrary tends to be true: the painters and sculptors with the highest prices are, on the whole, those with the highest artistic achievement" (Frey and Pommerehne, 1989, p. 93).[3]

Apart from aesthetic (expert) evaluation of his work, the artist's nationality and possibly years since his or her death, the size, style and medium of the work of art, advertising activities of the gallery, per capita income and the rate of return on traditional investment portfolios, are determinants of the *auction* price (Frey and Pommerehne, 1989, pp. 98–99). With these variables, Frey and Pommerehne manage to account for 61 percent of the variance in prices. The major flaw of the research is, however, that past prices of the same artist are an important determinant. This finding underscores the path dependent nature of pricing art, but at the same time it is unsatisfactory because it merely raises the question of how these past prices have been determined (Plattner, 1996, p. 16). Likewise, Rouget et al. (1991) find for sales of modern French artists at the Parisian auction house Hôtel Drouot that the size, technique and "provenance" of the work as well as the age of the artist determine the price of the work; the variance in prices they manage to explain with a hedonic function is 20 percent of the total (Rouget et al., 1991, p. 149; for similar results see Anderson, 1974; Singer, 1978).

Apart from the fact that all studies on determinants of prices use auction rather than gallery data, they contain a serious methodological problem: by including all

variables in a least square regression analysis these studies implicitly assume that there are as many data on artists and galleries as there are on works of art. In fact, however, the total number of works of art in their data set have been produced by a smaller number of artists and have been sold at an ever smaller number of galleries. Therefore, the analysis of Frey and Pommerehne and Rouget et al. is based on an incorrect number of cases of artists and/or galleries.[4]

The disaggregation of data on a lower level (work of art) to a higher level (artist or gallery) leads to an unjustified increase in the significance of the statistical relations, as well as to ecological errors and to misguided interpretations. This can be illustrated with a hypothetical example. Suppose we have data on the prices of 1,000 works of art, made by five male and five female artists. Statements about the relation between the prices of those works of art and the gender of the artists should be based on 10 cases (n artists) rather than on 1,000 cases (n works of art). However, in an ordinary least square analysis gender would be implicitly treated as a characteristic of an artwork. As a result, the number of cases is inflated. One of the advantages of multilevel analysis is that it uses the correct number of cases on all levels of analysis.

3. Description of the Data

The data are derived from a policy of the Dutch government aimed at stimulating private collecting and buying of contemporary art. The government provides private buyers of contemporary art at a large selection of galleries with an interest-free loan. The purchase of the work is financed by the government, after which the buyer pays monthly instalments. Therefore, the government does not intervene on the art market directly. The selection is based on the professionalism of the gallery and the quality of the work of the artists it represents. For living artists and private buyers no restrictions exist for participating. There is a lower limit of 500 guilders and an upper limit of 12,500 guilders on the interest free loan, but no upper limit exists for the price of the works of art that can be bought via the arrangement (see Gubbels, 1995 for details of the arrangement). The government arrangement does not affect the price level on the market: comparable works of art are sold for identical prices, regardless of whether or not collectors make use of the arrangement.

The original data set contains prices and characteristics of over 16,000 works of art, sold between 1992 and 1998 for a total amount of over €34 million (almost €5 million on an annual basis). These works have been produced by more than 2,400 artists and were sold in over 230 Dutch galleries. Not all these data are used in the analysis: the cases for which both size and medium were missing are excluded. Missing values on demographic variables of artists and galleries have been substituted. In the analysis, we control for this substitution and show that it has no significant impact on the results. The following description of the works sold through the arrangement, as well as the description of the artists and the galleries,

is therefore based on the valid numbers of observations in the data, not on all the data.

The prices in the analysis are actual selling prices, not listed prices. The data set does not contain information on buyers, nor on the rest of (unsold) supply by the visual artists. The works sold via the government arrangement make up for approximately 10 percent of total gallery sales. Transactions at the lower and upper end of the market are under-represented in the data set. Collectors who are rich enough to purchase expensive works of art are less likely to obtain the interest free loan. Transactions in "low brow" galleries are also under-represented in the data, since these galleries are usually not admitted to the government arrangement. Leaving those segments aside, the data set provides an accurate representation of the "middle segment" of the total Dutch market.

A. WORKS OF ART

The number of works of art used in the analysis is almost 12,000 (Table I).[5] Mean price of these works is €2,227. The average surface of the two dimensional works is 8,161 square centimetres, so that one square centimetre of artwork costs about 28 €-cents on the Dutch market. The factor height is included for three-dimensional works of art, such as sculptures and (glass) objects. The average height of those works is 55 centimetres; every centimetre of a sculpture or other three-dimensional object costs about €40.

The number of works sold and the average price per year vary considerably. The changes in quantities sold reflect trends in the world wide art market, which suffered from a slump in the first half of the nineties. In 1996 the bottom of the market was reached; in the second half of the nineties both the number of works sold and the average selling price started rising again. In our analysis of determinants, dummy variables for each year control for this and other year-related influences on the price level such as inflation. The works of art have been categorised across seven different media. Paintings constitute both the largest and most expensive category of works of art sold on the Dutch market. As the analysis will reveal, prints (7% of all the works sold) are relatively cheap because they are not unique but instead sold in edition, ranging from 5 to over 250. Sculptures and glass or ceramic objects are also frequently sold via the arrangement.

B. ARTISTS

The data set contains relevant information on 2,089 artists who sold work through the arrangement in the period under study. Table II gives a summary of the characteristics of the artists in the sample.

Although the overall mean price of works sold via the arrangement is €2,227, the mean price per artist was €1,960. This implies that – on average – "expensive artists" sell more works than "cheap artists". In other words, the distribution of

Table I. Features of works

	Mean	Standard deviation
Price[a]		
Selling price	2,227.69	1,613.81
Size		
Surface (in squared cm)	8,161.15	8,069.27
Height (in cm)	55.47	38.96
Relation price–size		
Price per squared cm	0.28	
Price per cm/height	40.00	
Year		
1992	0.06	
1993	0.20	
1994	0.13	
1995	0.14	
1996	0.09	
1997	0.18	
1998	0.20	
Material		
Painting	0.50	
Print	0.07	
Sculpture	0.21	
Drawing	0.04	
Watercolour	0.06	
Glass, ceramic	0.09	
Other	0.03	
N	11,869	

[a] All prices are in EURO

success is skewed. The "best-seller" sold for nearly €700,000. The average artist earned approximately €12,500 over the period 1992–1998; the average revenue per artist per year is therefore only €1,800. This confirms findings of previous research that only a small percentage of artists can make a living from selling their work on the commercial market (see for instance Rengers and Plug, 2001).

The first interesting characteristic is the high average age of the artists in the arrangement. Apparently, it takes a long time before an artist starts selling on the private market.[6] Furthermore, male artists represent approximately 75 percent of the artists selling through the arrangement. The primary market for contemporary art is in other words dominated by men, which is striking since almost half of

Table II. Features of artists

	Mean	Standard deviation
Price[a]		
Mean price per artist	1,959.70	1,278.10
Total sales per artist	12,657	30,351
Sale characteristics (1992–1998)		
Number of works sold	5.68	11.70
Number of different galleries	1.44	1.09
Number of different media	1.36	0.70
Demographics		
Age	50.03	11.92
Female	0.25	
Foreign nationality	0.20	
Place of residence		
Amsterdam	0.21	
Rotterdam	0.04	
Abroad	0.22	
Other	0.53	
Career characteristics		
Participated in the BKR	0.19	
Received small grant (BKV)	0.18	
Received large grant (IS)	0.23	
Received commissions from the government	0.17	
Sold to a museum	0.19	
Average price of work sold to a museum	3,303.05	3,9347.47
N	2,089	

[a] All prices are in EURO.

the total population of visual artists in the Netherlands is female (Brouwer and Meulenbeek, 2000). The unequal gender distribution is partially explained by the high (average) age at which artists start selling work on the private market.[7]

The average number of works sold by any artist between 1992 and 1998 is 5.68. Remarkable is the fact that in the raw data selling prices for women are 20 percent lower than for their male colleagues. Not only do fewer female artists sell via the arrangement, they also sell for lower prices. In terms of average total sales, the difference between men and women evaporates. Many artists work in more than one medium (on average 1.36); their work is usually represented by more than one gallery (average 1.44). The majority of Dutch artists lives in Amsterdam, which is the cultural centre of the Netherlands.

Institutional recognition of artists can be measured by looking at the government arrangements in which the artist has been involved. As Rengers and Plug (2001) show, the institutional recognition of the artists in an important characteristic of the careers of Dutch visual artists. To obtain these data we have added data from a central government registration in which all forms of involvement between an artist and the Dutch government between 1984 and 1998 are listed. In Table II these arrangements have been organised under the heading of "career characteristics".

Of all artists in the sample, 56 percent did not participate in any of the schemes – apart, of course, from the interest free loan arrangement from which our data have been derived. These artists did not receive any individual subsidy, grant or commission, and did not sell to a museum via a government arrangement. Close to 20 percent of the artists sold work to public museums in the Netherlands. The prices of these works are considerably higher than on the market for private collectors: the average price per artist is €3,303 as opposed to the average price per artist of €1,959 on the private market.

C. GALLERIES

It is expected that prices of art are not only determined by characteristics of the works of art and the artists, but also by those of the gallery where the works are sold. Table III presents a description of the gallery characteristics that will be used in the analysis.

A large number of galleries (about one third in our sample) are situated in Amsterdam. For more than half of the galleries we know the year the gallery was founded. The oldest gallery in our analysis was founded in 1941, the "youngest" in 1995. The galleries in our sample have been established for 15 years on average. Between 1992 and 1998 the average gallery sold €130,248 worth of art via the arrangement; the average number of works sold was approximately 58. Again, the distribution is skewed; one gallery sold just over €18 million via the arrangement, while another gallery only sold art worth €794. We introduce two dummy variables for the institutional affiliation of the gallery (experimental or avant-garde versus traditional or easily accessible art) on the basis of membership of the two main gallery associations in the Netherlands, and participation in two large Dutch art fairs (Gubbels, 1995).

4. Supply and Demand on the Primary Market for Visual Art

One of the advances of this study is that we model determinants of prices that are related to supply and demand across three (hierarchical) levels: works of art, artists and galleries. Many of those determinants are likely to be relevant to both supply and demand. Like other studies that explain observed market prices, we solve this identification problem empirically by estimating "hedonic" price functions. Thus

Table III. Features of galleries

	Mean	Standard deviation
Price[a]		
Mean price per gallery	1,968.20	725.51
Total sales per gallery	130,248	217,389
Sale characteristics (1992–1998)		
Number of works	58.47	80.18
Number of artists	15.33	13.69
Percentage of artists also selling to museums	0.26	0.25
Location		
Amsteram	0.32	
Rotterdam	0.06	
The Hague	0.08	
Other	0.54	
Demographies		
Age of the gallery	14.95	9.69
Affiliation		
Traditional/easily accessible	0.35	
Avant-garde/experimental	0.33	
No clearly distinguishable affiliation	0.32	
N	203	

[a] All prices are in EURO.

we do not model demand and supply separately, but relate prices simultaneously to the wide variety of potential determinants the data set contains. In the following exploratory section we will nevertheless try to identify supply and demand factors on the three (hierarchical) "levels", and relate them to the variables in our data set.

A. WORKS OF ART

The main supply-side factors that play a role in the price level for works of art are related to the material aspects of the work, such as size, materials used and style. The first basic hypothesis is that within the body of work of each artist the price increases with size. On average, larger works of art cost more in terms of materials and require more labour time (Sagot-Duvauroux et al., 1992, p. 93). Abbing (1989) argues that this is not necessarily the case, and suggests that this effect can also be due to the institutionalised rule of pricing according to size that many galleries have adopted. In our analysis we look further than the relation between size and price for all artists. We also study the relation between the average price-level of

an artist and his or her marginal price for extra centimetres. Our expectation is that artists who start with a high initial price (i.e. regardless of size), charge more for every additional square centimetre than colleagues who start with a lower initial price.

Another factor that influences the price is the materials and techniques used in the work of art. For instance: oil paint is more expensive and labour intensive than water colour, and canvas more costly than paper. It can therefore be expected that paintings constitute the most expensive type of a two-dimensional work of art. Furthermore, works that are produced in edition such as silk screen prints or lithographs are per piece less costly to produce than unique works. Therefore they are likely to be sold for a lower price.

From the point of view of the buyers, other reasons exist to expect price differences between works of art. With regard to size, the demand for works of art of extreme sizes (both small and big) is likely to be lower than for works of "regular" size. Odd formats are difficult to display in either private houses or company buildings (Frey and Pommerehne, 1989, p. 88). In empirical terms, this may translate in a loglinear or polynomial relation between price and size. Given the value of authenticity in the art world, buyers tend to value works of art according to the "proximity" to their creator. Therefore, demand for paintings (as well as the price of paintings) is likely to be higher than for works made in edition (Zolberg, 1990, p. 87; Sagot-Duvauroux et al., 1992, p. 94).

B. ARTISTS

An important group of (artists') characteristics that may be of influence relates to the earlier career of the artist. On the supply side, age, which we interpret as an indicator of experience, influences the supply of art. On the basis of human capital theory we expect that older artists are more productive than their starting colleagues in terms of producing valuable art, because of their experience and "on-the-job training".[9] On the demand side, there seems little reason why buyers would prefer works of art of older artists over those of young artists for other reasons than differences in quality. However, older artists have had more time to establish a network among critics, curators and other cultural experts which enhances their visibility, reputation, demand and therefore the price-level of their output (Sagot-Duvauroux et al., 1992, pp. 91–92; Bowness, 1990). As Holger Bonus and Dieter Ronte argue regarding the relationship between credibility and economic value: "Networks (. . .) are especially useful for the exchange of commodities whose value is not easily measured" (Bonus and Ronte, 1997, p. 112).[10]

Likewise, we expect that institutional recognition of the artist, measured by the amount of government involvement in his or her career, has a positive effect on the selling price. Government rewards enhance the reputation of the artist and function as a "proof" of quality. The importance of the quality signal that every grant, subsidy or government commission sends out, depends mainly on the exclu-

siveness (and the amount of money involved) of that particular arrangement. Small grants with a mild selection process are likely to have small reputation effects, whereas larger grants are expected to have strong effects on reputations and hence the price level of the artists. Apart from the exclusiveness of the arrangement, the (related) visibility of the arrangement matters. Small grants and commissions are usually handed out in an anonymous manner: the artists apply and receive (or do not receive) funding. Other forms of support such as museum sales are more visible in the art world, as is shown in Pommerehne and Feld (1997).

Furthermore, we develop a number of hypotheses with respect to the residence of the artist. It is likely that artists who are living abroad – no matter what nationality they are – charge higher prices: galleries often have to make considerable (transaction) costs in order to display works from outside the Netherlands. These costs relate to shipping, insurance and to the need for Dutch galleries to pay a percentage of the selling price to foreign galleries who are usually the main representative of the artist. At the same time, demand for artists living abroad may be higher because potential buyers interpret the fact that the artists live and work abroad as a signal of quality, and galleries market these artists accordingly. In sum, we expect artists living abroad to sell for higher prices than artists living in the Netherlands.

The Dutch art market, like many foreign art markets, is structured in terms of a centre and a periphery (see Plattner, 1996, pp. 76–77). The centre is where demand is concentrated, reputations are built, and the density of social networks is highest. By any of those standards, Amsterdam is the centre of the Dutch art world. Moreover, living in Amsterdam is more costly than in the rest of the Netherlands. We therefore expect artists living in Amsterdam to sell for higher prices than elsewhere in the country. Finally, we test if the widespread finding that women are discriminated against in terms of wages and earnings is replicated in our data set.[11]

C. GALLERIES

As with artists, we expect that galleries in Amsterdam sell for higher prices, not only because rents are higher in Amsterdam (supply side) but also because demand is concentrated and reputations are established in the centre of the market (demand side). We expect that galleries with an "avant-garde" or institutional affiliation and with many artists selling works to museums are eager to maximise price, since they see price as a signal of quality. Traditional galleries are hypothesised to be more concerned with turnover or profit and can therefore be expected to sell more works of art for lower prices than avant-garde galleries.

Moreover, galleries that concentrate their sales efforts on a small number of artists, will sell works for a higher price level than galleries that divide their energy over a larger group. Just like artists, older galleries have been able to devote more time to establishing their reputation among experts and to enhancing their visibility in the art world, which will have a positive effect on the average price level. Before

testing these exploratory hypotheses, however, we elaborate in the next section on the methodology we use.

5. The Advantages of Multilevel Analysis

One of the central arguments of this paper is that prices on the market for visual art are determined by characteristics on different levels. In order to reproduce this approach in our statistical model, we apply so-called multilevel models that allow for a breakdown of variance components into the different levels of the analysis (works of art, artists, galleries). Therefore, the models give correct estimates of the price-effects of variables that appear at the lowest level (i.e. explaining price differences between works of art out of differences in size or technique), but also at higher levels (i.e. if price differences are caused by the gender of the artist or by the reputation of the gallery where the work is sold).

One of the important differences with regression analysis is that in a multilevel model the correct number of cases is used at each identified level. In other words, the standard errors of the effects are correctly estimated. Another advantage of applying multilevel models is that they provide information on the variance on one level relative to the total variance. In our case, this approach allows us to see how much of the observed price difference is related to characteristics of works of art, how much can be attributed to the artists, and which part is due to gallery characteristics. A third advantage is that multilevel modelling allows effects to differ across levels. In our model, for instance, we study the relation between the average price level and the price of extra centimetres for each individual artist. The following example, based on the assumed relation between the size of an artwork and its price, is included in order to illustrate the technique.

Figure 1 illustrates the example of the relation between selling price and size within the body of work of one artist (*ceteris paribus*). In this case, variance only exists on the level of works of art. There is however little reason to assume that all artists charge the same amount for every square centimetre of their work. A square centimetre painted by Picasso is more expensive than a square centimetre painted by an artist who just graduated from an art academy. Figure 2 represents differences in the relation between size and price for different artists.

In this representation, artists do not differ in the marginal price of extra centimetres, but they do so in their average price level or the initial price when size is not taken into account. In other words: the intercept of the price-size line differs between artists, but the slope of the line does not. In this case, there is variance at two levels: the level of the works of art and the level of artists. The variance at the level of artists can be modelled, and is likely to include factors such as experience, education, previous prices for works sold to museums and at auctions. In this paper, we look further than the relation between artwork and artist, since we also include gallery characteristics in the analysis. In the same manner as in which there may be different price-size lines for artists, differences between galleries can explain
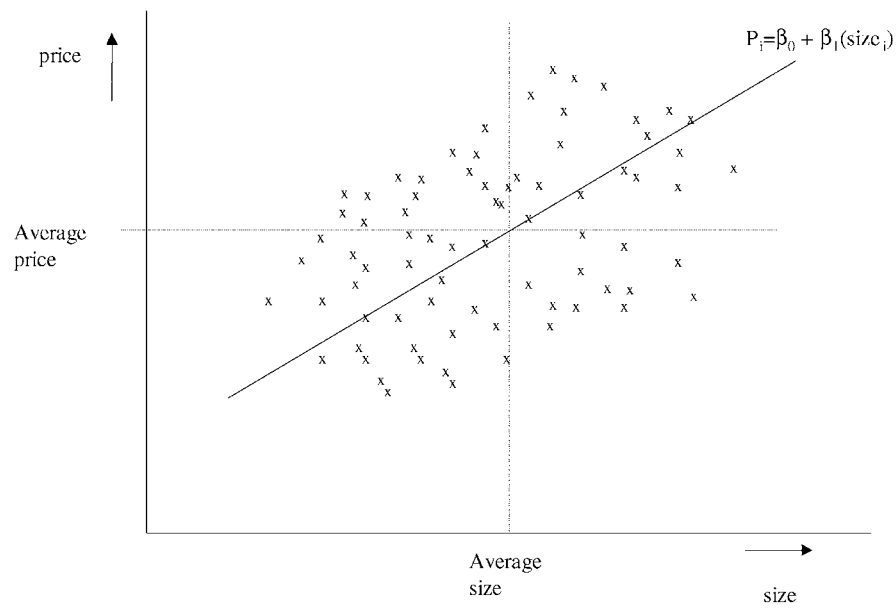
$$P_i = \beta_0 + \beta_1 (size_i)$$

price

Average price

Average size

size

Figure 1. The relation between price and size for one artist.

price

$$P_{i1} = \beta_{01} + \beta_1 (size_{i1})$$

$$P_{i2} = \beta_{02} + \beta_1 (size_{i2})$$

$$P_{i3} = \beta_{03} + \beta_1 (size_{i3})$$

Artist 1

Artist 2
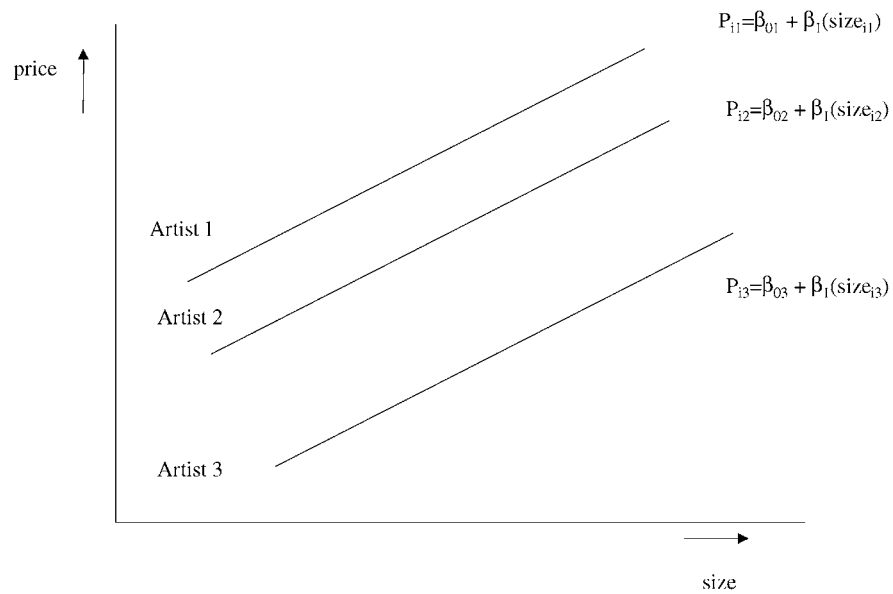
Artist 3

size

Figure 2. The relation between price and size for different artists.

$$P_{i1} = \beta_{01} + \beta_{11} (size_{i1})$$
$$P_{i2} = \beta_{02} + \beta_{12} (size_{i2})$$
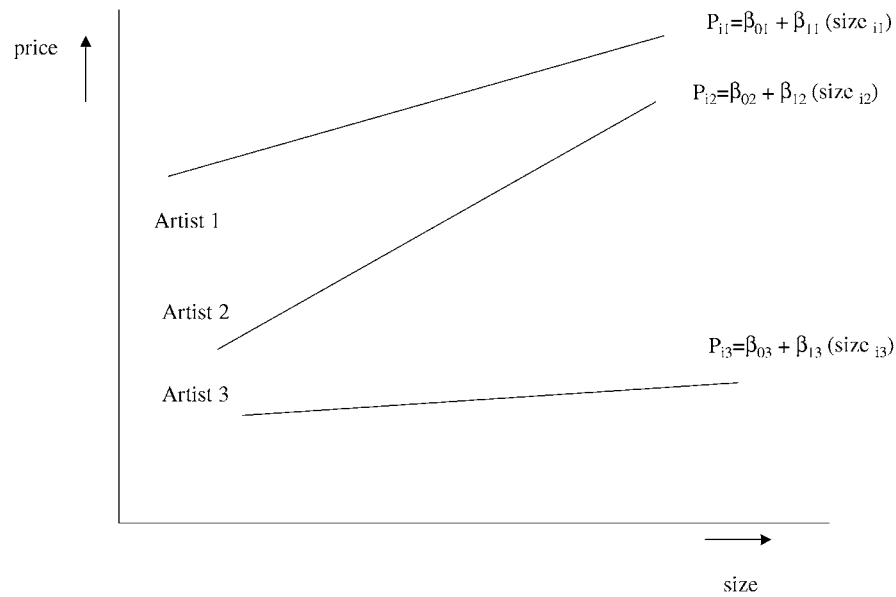$$P_{i3} = \beta_{03} + \beta_{13} (size_{i3})$$

Figure 3. Differences in the relation between price and size for different artists.

observed relations at the level of works and artists. Since these differences are modelled in a similar way as the relation between works of art and artists, this relation is not depicted graphically.[13]

Finally, not just the intercept, but also the slope of the line which depicts the relationship between size and price can vary between different artists. Some artists may, for example, charge less for a size increase of their work than other artists. For example, Van Gogh's paintings are all expensive, regardless of their format. In that case the lines in Figure 2 would no longer be parallel, but differ both in intercept and in slope, as in Figure 3.

These three models have a straightforward algebraic representation, as can be seen below. First, a base-line model is shown, then a fixed-effects model that includes explanatory variables at each of the three levels. Finally, we present a random-effects model in which the relation between price and size differs between artists.

The Base-Line Model

$$\text{Price}_{ijk} = \text{Constant} + v_{0k} + u_{0jk} + e_{0ijk} \tag{I}$$

The Fixed-Effects Model

$$\text{Price}_{ijk} = \text{Constant} + A_{ijk} + B_{jk} + C_k + v_{0k} + u_{0jk} + e_{0ijk} \tag{II}$$

The Random-Effects Model

$$\text{Price}_{ijk} = \text{Constant} + A_{ijk} + B_{jk} + C_k + D_j + u_{0jk} + e_{0ijk} \quad \text{with}$$
$$D_{1j} = \text{Constant} + u_{1jk}, \tag{III}$$

where i, j and k indicate the three observed levels (work of art, artist and gallery respectively); A, B, C stand for vectors of explanatory variables at the level of works of art, artists and galleries respectively; v, u and e represent error terms; D_{1j} is a "random" term that varies between artists (the j-level) with an error term of u_{1jk}. The base-line model, which has no explanatory power, is used to evaluate changes in explained variance (i.e. the three error terms).[14]

6. Analysis

In this section we estimate hedonic price functions with a multilevel structure (Table IV). Model 1, the base-line model (type I), has no explanatory power but merely serves as a point of reference. Models 2–4 are fixed-effects models (type II), where clusters of variables are introduced at each level. Model 5 is a random-effects model (type III), where the relationship between price and size is allowed to vary for different artists. In all models we use actual prices in EURO rather than the log of prices.

The discussion of the results is organised as follows: we first look at the fixed-effects of the included variables at each level separately, as well as the changes in (un)explained variance from one model to another. These findings are based on Model 4 in Table IV and on the summary of (un)explained variances that is depicted in Table V. Next, we briefly discuss the random-effects Model 5. We conclude with an overall evaluation of the changes in explanatory power across the models. This discussion is again based on Table V.

A. DETERMINANTS OF PRICES ON THE LEVEL OF WORKS OF ART

In Model 4, the reference category for the year of sale is 1992. The global slump of the art market is reflected in a negative effect of the year-dummies for 1993 until 1996.[15] Prices in 1997 and 1998 are significantly higher than the year of reference, 1992. For the material of the artwork, the reference category is paintings. This is at the same time the most expensive material; for instance, a print is on average €1,991 cheaper than a painting.[16] Size is also included as an explanatory variable. We use standardised values for size in order to make sculptures and (glass or ceramic) objects comparable with two-dimensional works of art. The size of sculptures and pottery is in centimetres height; size of paintings is in square centimetres. For every extra standard deviation of size, the price of an artwork increases by 630 EURO; with a t-value of 52.5 this variable is a very strong predictor of prices. Thus

Table IV. Multilevel hedonic price functions for contemporary art in Dutch galleries

	Model 1 Baseline-model		Model 2 Artworks		Model 3 Artworks and artists		Model 4 Artworks, artists and galleries		Model 5 Artworks, size artists and galleries	
Constant	1,978	48[c]	2,131	72[c]	1,268	156[c]	882	198[c]	791	189[c]
Characteristics of works of art (A_{ijk})										
Year sold										
Sold in 1992			0		0	0	0	0	0	
Sold in 1993			−155	60[c]	−156	59[c]	−164	59[c]	−113	55[b]
Sold in 1994			−95	64	−108	63[a]	−118	63[a]	−85	59
Sold in 1995			4	64	−2	63	−13	63	−6	59
Sold in 1996			−56	67	−64	67	−73	67	−60	62
Sold in 1997			266	64[c]	259	63[c]	259	63[c]	310	59[c]
Sold in 1998			377	64[c]	364	63[c]	371	63[c]	402	59[c]
Material										
Painting			0		0	0	0	0	0	
Print			−1,895	63[c]	−1,989	63[c]	−1,991	63[c]	−1,886	59[c]
Sculpture			−336	45[c]	−315	44[c]	−318	43[c]	−279	42[c]
Drawing			−711	68[c]	−725	67[c]	−725	67[c]	−670	62[c]
Watercolour			−628	60[c]	−686	59[c]	−683	59[c]	−567	55[c]
Glass			−402	66[c]	−417	64[c]	−425	64[c]	−378	60[c]
Other			−346	85[c]	−329	83[c]	−329	83[c]	−227	78[c]
Standardized size $*10^{-3}$			0.63	0.012[c]	0.63	0.012[c]	0.63	0.012[c]	$0.85 + u_{size\,jk}$	0.024[c]

Table IV. (Continued)

	Model 1 Baseline-model	Model 2 Artworks	Model 3 Artworks and artists		Model 4 Artworks, artists and galleries		Model 5 Artworks, size artists and galleries	
Characteristics of artists (B_{jk})								
Sale characteristics (1992–1998)								
Number of works sold			8.72	2.44[c]	7.64	2.45[c]	3.88	2.35[a]
Number of works sold squared			−0.037	0.010[c]	−0.033	0.010[c]	−0.017	0.009[a]
Number of different galleries			24.05	17.15	30.69	17.16[a]	26.33	16.74
Number of different mediums			7.97	27.30	−0.75	27.3	16.66	26.14
Demographics*								
Age			11.20	2.62[c]	10.89	2.61[c]	13.62	2.52[c]
Female			−141	48[c]	−138	48[c]	−156	47[c]
Foreign nationality			263	105[b]	268	105[b]	258	102[b]
Place of residence								
Amsterdam			145	55[c]	138	55[b]	133	54[b]
Rotterdam			−202	105[a]	−200	106[a]	−168	105
Abroad			539	99[c]	525	99[c]	496	96[c]
Other			0	0	0	0	0	0
Career characteristics								
Participated in the BKR			152	52[c]	155	52[c]	72	50
Received small grant (BKV)			−120	60[b]	−125	60[b]	−109	59[a]
Received large grant (IS)			−168	66	−165	67[b]	−152	65[b]
Received commissions from the government			173	69[b]	174	70[b]	193	68[c]
Sold to a museum			98	66	87	67	62	65
Average price of work sold to a museum			0.05	0.01[c]	0.05	0.001[c]	0.04	0.01[c]

Table IV. (Continued)

	Model 1 Baseline-model	Model 2 Artworks	Model 3 Artworks and artists	Model 4 Artworks, artists and galleries		Model 5 Artworks, size artists and galleries	
Characteristics of galleries (C_k)							
Sale characteristics (1992–1998)							
Number of works sold				2.98	0.71 [c]	2.98	0.66 [c]
Number of artists				−7.87	4.59 [a]	−8.57	4.30 [b]
Percentage of artists also selling to museums				2.09	1.92	2.29	1.83
Location of the gallery							
Amsterdam				181	98 [a]	223	92 [b]
Rotterdam				95	162	29	154
The Hague				99	133	71	125
Other				0	0	0	0
Demographics*							
Age of the gallery				7.98	4.84 [a]	8.16	4.54 [a]
Affiliation							
Traditional/commercial				86	105	73	99
Avant-garde/experimental				20	110	40	104
No clearly distintuishable affiliation				0	0	0	0

Table IV. (Continued)

	Model 1 Baseline-model	Model 2 Artworks	Model 3 Artworks and artists	Model 4 Artworks, artists and galleries	Model 5 Artworks, size artists and galleries
Other statistics					
Total variance	2,555,103	2,180,586	1,933,573	1,873,186	1,710,035
e_{0ijk} (works of art)	1,654,307	1,178,073	1,175,623	1,175,816	917,436
u_{0jk}	608,083	695,248	564,225	564,252	680,803
v_{0k} (galleries)	2,92,713	307,265	193,725	133,116	111,796
$u_{size\,jk}$					0.42
Covariance $u_{size\,jk} - u_{0jk}$					307
−2 log likelihood	206,038	202,762	202,353	202,312	200,987
N (works of art)	11,869	11,869	11,869	11,869	11,869
N (arts)	2,089	2,089	2,089	2,089 7	2,089
N (galleries)	203	203	203	203	203

* Control dummies indicating missing values on demographic variables were included in the analysis. They are not depicted, since they were insignificant. Standard errors in italics; [a] significant at 90% level; [b] significant at 95% level; [c] significant at 99% level.

Table V. Changes in (un)explained variance across Models 1–4[a]

	Baseline model (%)	Change Model 2 (%)	Change Model 3 (%)	Change Model 4 (%)	Model 4 (%)
Total variance	2,555,103 (100)	−15	−24	−27	1,873,186 (100)
U_{0ijk} (work of art)	1,654,307 (65)	−29	−29	−29	1,175,816 (63)
U_{0jk} (artist)	608,083 (24)	+14	−7	−7	564,252 (30)
V_{0k} (gallery)	292,713 (11)	+5	−34	−55	133,116 (7)

[a] All changes in variance are relative to the baseline model.

the effects that we hypothesised for material and size (Section 4) are confirmed by the data.

Including artwork-related variables in Model 2 results in a large drop in unexplained variance at the level of works of art (Table V). At the level of artists and galleries, however, the unexplained variance increases rather than decreases. This indicates that within the body of work of one artist, price and size correlate strongly for reasons mentioned before (Section 4). The characteristics of the works are however of no help for the explanation of price differences between artists. On the contrary: size and other material differences between works of art partly mask price differences between the work of different artists, as is indicated by the increase in unexplained variance on the level of artists.

B. DETERMINANTS OF PRICES ON THE LEVEL OF ARTISTS

As can be seen in Model 4, the main effect on price of the number of works an artist sells is clearly positive: apparently success on the market translates into higher prices and increases in sales simultaneously. This can be interpreted as a evidence of a so-called "Veblen effect" on the art market, which means that prices are used by collectors as an indicator of quality (Leibenstein, 1950; Throsby, 1994). An alternative interpretation is that dealers and artists choose for a penetration strategy; accordingly they start pricing low and only increase the price level when a critical level of sales has been established.

The negative effect on price of the squared number of works sold indicates that the overall effect evens out when the number of works sold increases. The peak of the price influence of the number of works sold lies at 206 works of art. Finally, variables measuring the diversification in the artist's body of work (i.e. the number of different techniques and the number of galleries sold through) do not have significant effects on price.

Demographic variables (sex, age, residence) also have significant effects on the price level across artists. As expected, the works of older artists are more expensive

than the works of their younger colleagues. Every year of age difference "creates" a price gap of 11 EURO between two similar artists. There is no evidence that this age effect evens out, since polynomial age terms did not have a significant impact on prices. Female artists receive a lower price for their works of art. The effect reported here is smaller, however, than the 20 percent gender gap in prices that we found in the descriptive analysis in Section 3. We partly explain the gender gap by including factors such as age and the size of the work. The work of female artists is not only cheaper because the maker is female, but also because female artists are on average younger than their male colleagues and because females have had different careers – in terms of government recognition – than men.[17]

As predicted, the most expensive works of art are those of foreign artists living abroad, while a small price premium is evident for Amsterdam artists. A "price penalty" of €202 exists for artists living in Rotterdam. Compared to the reference group of artists living elsewhere in the Netherlands, the works of Amsterdam artists are on average about €140 more expensive.

Finally, the effects of institutional recognition on prices are mixed. Some grants have a positive effect on the price level of an artist; the participation in other arrangements leads to a downward pressure on price. It is outside the scope of this paper to look in detail at the effects of all different grants. The analysis shows that an artist who has received a BKR-subsidy is across the board more than €155 more expensive than a colleague who did not receive such a subsidy. People who receive a small grant (BKV) from the government tend to sell for slightly lower prices; surprisingly, the large prestigious grants (IS) of the government also have a negative effect of €165. Furthermore, the price level on the private market of an artist is positively correlated with his or her price level on the market for museum acquisitions.

Adding artist-related variables explains a large amount of variance not just at the level of artists but also at the gallery level, as is shown in Table V. Apparently, price differences between galleries are partly explained by characteristics of the artists. In other words: "expensive" galleries are to some extent expensive because they sell works of "expensive" artists (old, foreign, male artists, for example). This implies that one function of the galleries is to pass on price-increasing (or price-decreasing) factors at the artist's level to the general public. This mechanism does not occur between works of art and artists and galleries, as can be seen by comparing the explained variance in Model 4 with the model containing only characteristics of works of art (Model 2). Thus galleries choose expensive or cheap *artists*, rather than expensive or cheap *works of art*.

C. DETERMINANTS OF PRICES ON THE LEVEL OF GALLERIES

Remarkably, most characteristics of galleries do not have a significant effect and do not explain a large amount of variance either. A small positive effect exists for the number of works sold through a gallery (almost 3 EURO for every additional

work), but the magnitude of this gallery effect is much smaller than the effect of numbers sold by an artist. Apparently, galleries are not able to add economic value themselves, apart from the selection function mentioned above. Compared to the rest of the Netherlands, galleries located in Amsterdam are more expensive than their competitors elsewhere in the country (approximately 181 EURO per artwork). This may be caused by higher operating costs in the capital, and/or by Amsterdam's role as the centre of the Dutch art world. The age of the gallery only has a small, albeit significant effect: for every additional year the gallery exists, the price increases on average by approximately 8 EURO per artwork. The affiliation of the gallery (traditional versus experimental) does not have a significant effect on the price of works sold. This finding does not preclude that both gallery circuits can have their own local price maximum.

D. THE RANDOM-EFFECTS MODEL

To repeat, Models 1–4 focused on the fixed effects of determinants in the data set. Finally, we show a random-effects model (Model 5) in which we relax the (unlikely) assumption that the size effect is identical for all artists. Thus, we estimate a model similar to Model 4 with one extra equation, in which the size effect is modelled (in this case with a constant and an error term). Model 5 is a first step towards a better understanding of the complexities of price formation.

In this representation, the main effect of size is 0.85, which means that on average an increase in size with one standard deviation leads to a price increase of €850. This effect varies between artists with a normally distributed error term $u_{\text{size } jk}$. The variance of this error term is 0.42, the standard error its square-root: 0.64. Therefore close to two thirds of the size-effects of all artists (what they charge extra for a larger work) lies between 210 EURO and 1,490 EURO for an extra standard deviation of size. The covariance between $u_{\text{size } jk}$ and u_{0jk} is positive (307), which indicates a positive correlation between intercept and slope. The main advancement of Model 5 is that we learn that expensive artists charge higher prices for each extra square centimetre of art than their "cheap" colleagues. In terms of the example depicted in Figure 3, this implies that the price-size lines for artists with a low initial price-level are less steep than the price-size lines of artists with a higher initial price-level. This model performs better in terms of explained variance than the fixed effect models, particularly on the level of works of art. This is mainly due to relaxing the assumption that size has a constant effect. More variance is now found across artists. The effects of the other explanatory variables change little.

E. EXPLAINED VARIANCE

To evaluate Models 1-4, we will once again look at the explanatory power of the models indicated by the (changes in) explained variance as depicted in Table V. We only compare the fixed-effect Models 1–4.[18] The baseline model shows the initial

variance at the three levels. In the baseline model, almost two thirds (65%) of the total variance occurs at the level of the works of art; 24 percent can be attributed to the artists and 11 percent is apparent among galleries. Including characteristics of works of art explains 15 percent of the total variance. This main effect breaks down in three separate effects: the variance among works of art drops by 29 percent, and the variance among artists and galleries increases by 14 and 5 percent respectively. This indicates that characteristics of the works of art partly "mask" differences between artists and galleries. In other words: when we control for the size and medium of the works, the differences between galleries and (most notably) artists are larger than without accounting for the characteristics of the works of art. Thus, "cheap" artists often make slightly larger works of art using more expensive techniques.

The next step is to include characteristics of the artists in the model. The overall unexplained variance drops with another 9 percent, which is due to reduced variance among artists (-7%) and particularly among galleries (-34%). In other words: characteristics of the artists explain some variance among artists, and a much larger part of variance among galleries. Including gallery characteristics does not alter the (un)explained variance among artists or works of art, and improves our explanatory power on the level of galleries with another 22 percent. From these shifts among galleries, we can see that characteristics of artists are the strongest predictor of price differences among galleries. Therefore we conclude that galleries derive their price level particularly from the artists they represent, and less from their own characteristics.

In Model 4, 63 percent of the remaining variance is at the level of works of art, 30 percent occurs among artists and only 7 percent across galleries. Overall, we account for 27 percent of the variance in prices in our data. In terms of explained variance, our model performs best among galleries, whereas it turns out to be most difficult to explain variance on the level of artists.

7. Conclusion

The model we developed in this study predicts prices on the Dutch market with the help of a large number of potential determinants. The breakdown of variance in price into three levels not only allows for better estimation and modelling, it is also helpful for exploring new theoretical edges and reinterpreting existing ideas about the intriguing and seemingly randomly determined prices of works of visual art. This exploratory model highlights some interesting processes in explaining prices of visual art. These can be summarised as follows: our study reinforces earlier findings that size is one of the strongest predictors (Frey and Pommerehne, 1989; Sagot-Duvauroux et al., 1992). The multilevel character of our analysis adds to this finding that size only explains variance on the level of works of art, not on the level of artists or galleries. In other words, price differences in the body of work of different artists are not explained by differences in size of these works. The

relation between size and price was further explored in a random-effects model. This model shows that the initial price-level of artists correlates with the price of extra centimetres.

In the hedonic price function estimated here, the number of works sold has a significant positive effect on prices. This is in line with previous studies which suggest that when artists become successful, prices of their works and sales increase simultaneously (Rouget et al., 1991). On a theoretical level, this effect may point at a "Veblen-effect", where price is seen as an indication of quality. Another explanation is that artists and galleries follow a market-penetration strategy: they start with low prices, and increase the price level when the artist becomes successful. Another finding from existing research, that artists who make work in different media sell for higher prices (Frey and Pommerehne 1989), is not supported by our analysis.

Strong overall predictors of the price level are the size and material of the work, and the age and place of residence of the artist. Remarkable is that artist's characteristics explain a large amount of variance on the level of galleries; in other words, the fact that galleries sell expensive works has more to do with the artist they represent than with their own characteristics. This suggests that the main function of galleries is to select artists. Conversely, gallery characteristics, such as the age of the gallery or its institutional affiliation, explain only a small amount of variance in prices.

Due to the richness of our data, some aspects of the price mechanism on the art market have remained sketchy in our analysis. Indeed, because our study is the first quantitative study that focuses on the primary rather than the secondary art market, it is of necessity exploratory: apart from answering questions it also raises new ones. Future research should focus on the way government intervention in the art world in general affects the market and the price mechanism in particular. Also, the gender dynamics of the price mechanism should be analysed in more detail than we were able to do here. Finally, the potentials of multilevel modelling have not been exhausted in our analysis; we have, for instance, only allowed the effect of size to fluctuate for different artists. In future research the effect of other variables on the level of artists and galleries should be studied in greater detail.

To conclude: the approach adopted in this paper is attractive both for empirical (better estimates, more accurate interpretations) and theoretical reasons. This paper suggests that we can indeed improve our understanding of how markets work by paying close attention to the fact that supply, demand and prices of art (and, in fact, of almost all commodities) are determined by factors that operate on *different levels* of analysis. The identification and modelling of those different levels is a step away from the mechanical and over-abstracted approach towards markets that is common in economics, and a step towards incorporating the social and institutional processes that underlie market exchange.

Notes

* This paper is a revised version of the paper that jointly won the Presidents' Prize awarded at the 12th International Conference of the Association of Cultural Economics held in Minneapolis in 2000.
** Earlier versions of this paper were presented at the Association of Cultural Economics International Conference, Minneapolis 2000 and at the Seminar Cultural Economics of the Department of Art and Culture Studies, Erasmus University Rotterdam. We thank Ruth Towse, Arjo Klamer, Harrie Ganzeboom, Hans Abbing, Ineke Nagel, Christopher Madden and Michael Hütter for helpful comments. The IVA Tilburg (Research File Artists 1990–1999), the Dutch Ministry of Education, Culture and Science and the Mondriaan Foundation are gratefully acknowledged for providing the data on which the analysis is based.

1. Sagot-Duvauroux et al. (1992) add a fourth level of "macro-economic factors" (p. 91).
2. According to one estimate, only 0,5% of the works sold today will still have market value in 30 years (Caplin, 1989, p. 242).
3. For a more elaborate critique, see Bonus and Ronte (1997).
4. In the analysis of auction data, the levels of analysis differ from the levels in our data. The methodological problems are however identical. A different way to solve this problem is to estimate relations for each individual artist in the sample. See for instance Galenson (2000).
5. Almost all works of art with missing values on medium and size were sold in 1992, the first year included in our analysis. From 1993 onwards, the quality of the data on the actual works has improved significantly. Consequently, almost all transactions for the years 1993 to 1998 are included in the analysis.
6. By contrast, other research has shown that the average age of Dutch visual artists is around 45 (Brouwer and Meulenbeek, 2000, p. 21). On average Dutch visual artists start their career around the age of 28, as can be seen in the Dutch labour market monitor of graduates from arts education (Rengers, 2000). The youngest artist selling via the government arrangement is 30.
7. The artist's profession has "feminised" rapidly over the past decades. Consequently, the older cohorts of visual artists consist of a larger percentage of male artists than the recent cohorts. Since commercial success on the art market is correlated with age, we expect that the percentage of men selling through the arrangement will decline in the future in the favour of women.
8. Hedonic price functions are applicable whenever (large scale) data sets on prices and their potential determinants are available. Hedonic models are used to estimate demand or prices for a wide range of goods including real estate (Case et al., 1997), cars (Murray and Sarantis, 1999), life stock (Jabbar, 1998) and wine (Nerlove, 1995).
9. In other studies, experience does not prove to be an important determinant of the labour market success of artists (see Throsby, 1996; Towse, 1996; Rengers and Madden, 2000). Instead, other – more precise – indicators of career progress have been used, including earlier achievements in the art world. These earlier achievements, such as prestigious exhibitions in galleries and museums, prizes, and publications on the artist's body of *oeuvre*, are likely to be particularly important for demand. For data reasons, this paper focuses on earlier achievements of the artists on the government market and other forms of government involvement. The advantage of these data is the fact that the registration is complete and systematic. The disadvantage is the fact that most activities relating to the private market are outside the scope of the government.
10. The idea that recognition by experts such as critics has strong repercussions for the economic value of a work of art, has become a major theme in the sociology of art (cf. Becker, 1982; Crane, 1987; Moulin, 1987, 1994). A strong statement comes from Pierre Bourdieu, who argues in *The Field of Cultural Production* that the actual production process on art markets is not the production of the work of art itself, but the "consecration" of the artist (Bourdieu, 1993, p. 76). According to Bourdieu a work of art has value in proportion to the labour that "cultural businessmen" have performed to consecrate the work, i.e. to produce "belief" in its value.

11. Career and labour market differences are also apparent in the cultural sector. Rengers and Madden (2000, p. 338) for instance report "a persistent earnings gap between male and female artists" in Australia. See also Cowen (1996) and Janssen (2001).

12. Many applications of multilevel models can be found in educational research, where pupils are nested within classes and within schools. See for instance Nutall et al. (1989) or Goldstein and Spiegelhalter (1996). The programme used for the estimation is MLWIN (Multilevel for Windows).

13. In a two dimensional space, this picture would look identical to Figures 1-3, with different labels on the axes. A "complete" graphical representation of the three levels (works of art, artists and galleries) would be three-dimensional.

14. Our data differ from the model depicted here in the sense that artists are not uniquely nested within galleries. Table 2 shows that artists are – on average – represented by 1.44 galleries. To check whether this violation of the assumptions influenced the results, we estimated the same models on a selection of the data in which artists were represented by only one gallery. This analysis produced similar results, and is therefore left aside.

15. For an overview of world-wide trends on the art market, see: http://www.art-sales-index.com.

16. This strong negative effect on price does not imply that artists who sell prints are worse off, as becomes clear from Model 4. These artists usually sell prints in large quantities, which correlates with a high price.

17. We performed a separate stepwise analysis (not reported here) for the price difference between men and women. In this analysis the gross price-difference between works of male and female artist was €231. Including year and medium dummies increased the gender gap to €270. Including size (−€27), city of residence (−€8), and most importantly age (−€54) and the career characteristics (−€36), reduced the unexplained gender gap to €144, which almost equals the gender gap reported in Table IV.

18. Comparing variance between fixed-effect and random-effect models is irrelevant, since the modelling of variance across levels differs between the two.

References

Abbing, Hans (1989) *Een economie van de kunsten. Beschouwingen over kunst en kunstbeleid.* Historische Uitgeverij, Groningen.

Anderson, Robert C. (1974) "Paintings as an Investment". *Economic Inquiry* 12: 13–26.

Ashenfelter, Orly (1989) "How Auctions Work for Wine and Art". *Journal of Economic Perspectives* 3 (Summer): 23–36.

Baumol, William J. (1986) "Unnatural Value: Or Art Investment as Floating Crap Game". *American Economic Review* 76 (May): 10–15.

Becker, Howard S. (1984) *Art Worlds.* University of California Press, Berkeley.

Bonus, Holger and Ronte, Dieter (1997) "Credibility and Economic Value in the Visual Arts". *Journal of Cultural Economics* 21: 103–118.

Bourdieu, Pierre (1993) *The Field of Cultural Production. Essays on Art and Literature.* Polity Press, Cambridge.

Bowness, Alan (1990) *The Conditions of Success: How the Modern Artist Rises to Fame.* Thames and Hudson, London.

Brouwer, Natasja and Meulenbeek, Heidi (2000) *De markt voor beeldende kunst; de markt en de financiële positie van de beeldend kunstenaars 1998.* Ministerie van Onderwijs, Cultuur en Wetenschappen, The Hague.

Buelens, Nathalie and Ginsburgh, Victor (1993) "Revisiting Baumol's 'Art as a Floating Crap Game'". *European Economic Review* 37: 1351–1371.

Caplin, Lee (1989) *The Business of Art.* Prentice-Hall, Englewood Cliffs.

Case, Bradford, Pollakowski Henry O., and Wachter, Susan M. (1997) "Frequency of Transaction and House Price Modelling". *The Journal of Real Estate Finance and Economics* 14 (1/2): 173–187.

Cowen, Tyler (1996) "Why Women Succeed, and Fail, in the Arts". *Journal of Cultural Economics* 20 (2): 93–113.

Crane, Diana (1987) *Transformation of the Avant-Garde*. University of Chicago Press, Chicago.

Fase, Martin M.G. (1996) "Purchase of Art: Consumption and Investment". *De Economist* 144 (4): 649–669.

Fase, Martin M.G. and van Tol, Mariska (1994) "Het monetaire rendement van beleggen in schilderijen". *Economisch Statistische Berichten* (August): 684–689.

Frey, Bruno S. (1997) "Art Markets and Economics: Introduction". *Journal of Cultural Economics* 21: 165–173.

Frey, Bruno S. and Eichenberger, Reiner (1995) "On the Return of Art Investment Return Analyses". *Journal of Cultural Economics* 19: 207–220.

Frey, Bruno S. and Pommerehne, Werner W. (1989) *Muses and Markets*. Basil Blackwell, Oxford.

Galenson, David W. (2000), "The Careers of Modern Artists". *Journal of Cultural Economics* 24 (2): 87–112.

Goetzmann, William N. (1993) "Accounting for Taste: Art and the Financial Markets over Three Centuries". *American Economic Review* 83 (5): 1370–1376.

Goldstein, H. and Spiegelhalter, D.J. (1996) "League Tables and Their Limitations: Statistical Issues in Comparisons of Institutional Performance". *Journal of the Royal Statistical Society, A.* 159: 385–443.

Gubbels, Truus (1995) "Korting en krediet voor beeldende kunst". *Boekmancahier* 7 (23, 24): 8–22, 193–204.

Gubbels, Truus and Voolstra, Gerben (eds.) (1998) *Visies op beleid en markt*. Boekmanstichting/Mondriaan Stichting, Amsterdam.

Heilbrun, James and Gray, Charles M. (1993) *The Economics of Art and Culture. An American Perspective*. Cambridge University Press, Cambridge.

Jabbar, M.A. (1998) "Buyer Preferences for Sheep and Goats in Southern Nigeria: A Hedonic Price Analysis". *Agricultural Economics* 18 (1): 21–30.

Janssen, Susanne (2001) "The Empirical Study of Careers in Literature and the Arts", in D.H. Schram and G.J. Steen (eds.), *Psychology and Sociology of Literature*. John Benjamins, Amsterdam.

Leibenstein, Harvey (1950) "Bandwagon, Snob, and Veblen Effects in the Theory of Consumers' Demand". *Quarterly Journal of Economics* 64 (2): 183–207.

Moulin, Raymonde (1987) *The French Art Market. A Sociological View*. Rutgers University Press, New Brunswick.

Moulin, Raymonde (1994) "The Construction of Art Values". *International Sociology* 9 (1): 5–12.

Murray, Jonathan and Sarantis, Nicholas (1999) "Quality, User Cost, Forward-Looking Behavior, and the Demand for Cars in the U.K.". *Journal of Economics and Business* 51 (3): 237–258.

Nerlove, Marc (1995) "Hedonic Price Functions and the Measurement of Preferences: The Case of Swedish Wine Consumers". *European Economic Review* 39 (9): 1697–1716.

Nuttall, D. L., Goldstein, H., Prosser, R., and Rasbash, J. (1989) "Differential School Effectiveness". *International Journal of Educational Research* 13: 769–776.

Pesando, James E. (1993) "Art as an Investment: The Market for Modern Prints". *American Economic Review* 83 (5): 1075–1089.

Plattner, Stuart (1996) *High Art Down Home. An Economic Ethnography of a Local Art Market*. Chicago University Press, Chicago.

Pommerehne, Werner W. and Feld, Lars P. (1997) "The Impact of Museum Purchase on the Auction Prices of Paintings". *Journal of Cultural Economics* 21 (3): 249–271.

Rengers, Merijn (2000) *De arbeidsmarktpositie van afgestudeerden van het kunstvakonderwijs: Kunsten-monitor 1998*. HBO-Raad, The Hague.

Rengers, Merijn and Plug, Erik (2001) "Private or Public". *Journal of Cultural Economics* 25 (1): 1–20.

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

Rouget, Bernard, Sagot-Duvauroux, Dominique, and Pflieger, Sylvie (1991) *Le marché de l'art contemporain en France. Prix en stratégies*. La documentation Française, Paris.

Sagot-Duvauroux, Dominique, Pflieger, Sylvie, and Rouget, Bernard (1992) "Factors Affecting Price on the Contemporary Art Market", in Ruth Towse and Abdul Khakee (eds.), *Cultural Economics*. Springer, Berlin.

Schneider, Friedrich and Pommerehne, Werner (1983) "Analyzing the Market of Works of Contemporary Fine Arts: An Exploratory Study". *Journal of Cultural Economics* 7: 41–67.

Singer, Leslie (1978) "Microeconomics of the Art Market". *Journal of Cultural Economics* 2: 21–40.

Throsby, David C. (1994) "The Production and Consumption of the Arts: A View of Cultural Economics". *Journal of Economic Literature* 32 (March): 1–29.

Throsby, David C. (1996), "Disaggregated Earnings Functions for Artists", in Victor A. Ginsburgh and Pierre M. Menger (eds.), *Economics of the Arts: Selected Essays*. Elsevier, Amsterdam.

Towse, Ruth (1996) "Economics of Training Artists", in Victor A. Ginsburgh and Pierre M. Menger (eds.), *Economics of the Arts: Selected Essays*. Elsevier, Amsterdam.

Zolberg, Vera L. (1990) *Constructing a Sociology of the Arts*. Cambridge University Press, Cambridge.