# IS COMPREHENSIVE EDUCATION REALLY FREE? A CASE STUDY OF THE EFFECTS OF SECONDARY SCHOOL ADMISSIONS POLICIES ON HOUSE PRICES IN ONE LOCAL AREA

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**No 581**

**WARWICK ECONOMIC RESEARCH PAPERS**


DEPARTMENT OF ECONOMICS

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December 2001

(Warwick Economic Research Paper Number 581)



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# Is Comprehensive Education Really Free? A Case Study of the Effects of Secondary School Admissions Policies on House Prices in One Local Area

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## Nontechnical Summary

This study investigates the question of whether house prices are higher in the catchment area of popular and heavily oversubscribed secondary schools. It is often claimed that parents are willing to pay more for housing in order to secure a choice of school for their children. Advertisements for houses for sale often mention the school catchment area if it is a popular one. This question has not previously been examined by means of a rigorous statistical analysis and the only evidence we have on it is anecdotal.

This study test for such effects using a sample based on two popular comprehensive schools, in one local authority, Coventry, that are regularly oversubscribed. It compares prices of houses for sale in their catchment areas with those of neighbouring schools, using statistical techniques to allow for differences in the house size and quality. The basic data consists of a sample of 248 houses for sale in July 2000.

It finds that houses are more expensive in the catchment areas of these two schools, after having taken account of all the other factors that influence house prices. Houses in the Coundon Court catchment area are found to be about 20 percent more expensive than outside. For an average house in the Coundon area this increases its price by about £10,000 and for an average house in Allesley by about twice that. Houses in the Finham Park

catchment area are about 16 percent more expensive which adds about £16,000 to the price of an average house in Earlsdon.

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## Abstract

This paper reports on a study that tests the anecdotal hypothesis that parents are willing to pay a premium to secure places for their children in popular and oversubscribed comprehensive schools. Since many local education authorities use admissions policies based on catchment areas and places in popular schools are very hard to obtain from outside these areas - but very easy from within them - parents have an incentive to move house for the sake of their children's education. This would be expected to be reflected in house prices. The study uses a cross sectional sample based on two popular schools in one local education authority area, Coventry. Differences in housing quality are dealt with by using the technique of hedonic regression and differences in location by sample selection within a block sample design. The sample was chosen from a limited number of locations spanning different catchment areas in order to reduce both observable and unobservable variability in nuisance effects while maximising the variation in catchment areas. The results suggest that there are strong school catchment area effects. For one of the two popular schools we find a 20 percent premium and for the other a 16 percent premium on house prices *ceteris paribus*.

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BY DENNIS LEECH AND ERICK CAMPOS

The public provision of secondary education in England is now overwhelmingly based on a system of comprehensive or community schools to which entrance is freely open to children of all abilities aged 11 without any selection by examination. The system is designed to be universal and egalitarian and is intended to avoid the unfairness and rigidity that resulted in the past as a result of the 11-plus exam[1].

In practice, however, the system is not truly comprehensive. There is a substantial fee-paying independent sector in which academically selective independent grammar schools offer a strongly examination-oriented curriculum as well as non-selective private schools. Within the public sector maintained voluntary schools offer denominational education where there is selection by religious affiliation rather than ability. Among community schools there are quite large differences in ethos, racial mix, socio-economic composition and academic emphasis within the curriculum, even within the same local education authority (LEA). Schools differ in such things as whether they are co-educational or single-sex, their age range, their policy on school uniform, and if they are a technology college, a language college or an arts college. Parents have a legal right to express a choice of school and such qualitative factors as these provide the set of features on which they frequently base their choice. A very important basis of parental choice, of course, is schools' results in public examinations.

[1] Some parts of the country continue to operate a selective system where places in grammar schools are still awarded in this way; such areas contain a very small minority of the population. Out of 149 local education authorities in England 15 have never completely adopted the comprehensive principle and are still fully selective with grammar and secondary modern schools and a further 18 retain some selection with grammar schools alongside comprehensives. Overall about 92 percent of pupils attend comprehensives, 5 percent grammars and 4 percent secondary moderns (rounded numbers, taken from OFSTED, 2000).

However parental choice is necessarily limited by the capacity of the schools since popular schools quickly tend to become full. Where the number of places parents have expressed a preference for in a particular school exceeds the number of places available, the admission authority[2] is legally obliged to apply the oversubscription criteria that are laid down in its own published admissions policy in deciding which parents' preferences it should meet. Admission authorities have wide discretion to determine their oversubscription criteria under the DfES's code of practice (see the website at DfES (2001)), provided these are "objective, clear, fair, compatible with admissions and equal opportunities legislation, and have been subject to the [legally required] consultation". Commonly used and acceptable criteria include: where there is an older brother or sister in the school, distance from home to school, ease of access by public transport, medical or social grounds, catchment areas and transfer from named feeder primary schools, as well as parents' ranking of preferences. Admission authorities "should make clear the order of priority in which the criteria will be applied, and how any tie-break decisions will be made." Moreover, even where the admission authority is the LEA, it must consider applications from parents living outside its own area equally with those from its own residents[3]. Parents have a right of appeal to an independent tribunal against a decision not to award a place.

There is therefore an enormous variety of school admission arrangements because of the large number and relative autonomy of admissions authorities. Among LEAs there are many different systems, even among neighbouring, or socially and politically comparable, authorities. The relevant information is published to prospective parents by the local authorities themselves, but it is only available locally and is not collected centrally by the

[2] Normally the admission authority is the LEA in the case of community schools and voluntary controlled schools and the school's governing body in the case of voluntary aided, special agreement and foundation (former grant maintained) schools. It is the LEA for all schools in this study.

[3] This is particularly relevant in London. The Greenwich judgement in 1989 established that LEAs are not allowed to give priority to children simply because they live in the authority's administrative area.

DfES[4]. This heterogeneity means researchers cannot rely on institutional assumptions being valid across different geographical areas of the country, and different models must be used to study parental behaviour in different areas. In some areas, for example, a lot of importance attaches to primary school catchment areas, since a pupil's primary school can be an important determining factor in secondary admissions (either because secondary admissions are based on "feeder" schools or because they differ in their success in preparing children for some entrance examinations), while in others primary schools play no role in secondary admissions policies, and therefore this factor is likely to be weak. Many LEAs employ secondary catchment areas[5] because they make it easier to plan provision mainly on the basis of demographic trends, which are seen as being in a sense fundamental, rather than having to respond too much to parental preferences, which are seen as being relatively mutable. Moreover, in the past catchment areas used to be the traditional basis of planning provision of "local schools for local people" before the reforms of the Thatcher era put parental choice at the centre of policy, and many LEAs continue to use them to a greater or lesser extent.

Where an LEA seeks to use catchment areas efficiently it naturally defines them according to the capacity of each of the schools concerned so that a place can be guaranteed for every child. This limits parental choice where a school is popular and tends to be full but at the same time it creates an incentive for families to circumvent this limitation by moving house at the appropriate time – or by taking schools into account as a factor when making housing location decisions. This is most likely to be a feature of the owner-occupied housing market given the small size of the private rented sector in most areas, and the difficulty of exercising real choice of housing location in the public housing sector. Therefore there is a likelihood of housing price differentials reflecting differences in school popularity. If such

[4] See West, Pennell and Noden (1998) and White, Gorard and Fitz (1999).

[5] White, Gorard and Fitz (1999) carried out a small sample survey of admission arrangements in 22 local authorities. They found that the use of catchment areas was associated with long term political control by traditional Labour.

differentials exist then it inevitably implies that there is an element of ability to pay as a by-product of the operation of the local authority's admissions policies.

If this hypothesised effect exists - and it has been described many times at the anecdotal level - it is a result of a tension between two policies: the need for value for money public services and a consumerist approach to raising school standards. On one hand efficiency in public spending requires both the elimination of surplus places and the provision of effective schools that are not over-full, while on the other hand a system driven by parental choice requires that popular schools should expand. Under recent legislation schools have been given more autonomy with devolved budgets based on student numbers and largely independent boards of governors, intended to make them more responsive to choice-based competitive pressures. However these pressures are necessarily limited by natural diseconomies of scale in schools; it is simply not in the interest of education for oversubscribed schools to expand beyond a certain size.[6].

This paper adopts a case-study approach centred on two very popular schools within one LEA, the City of Coventry. The schools are well known to be popular and estate agents frequently seek to capitalise on this by advertising the fact when a house for sale is located in one of their catchment areas (which they do not do for any other schools). Moreover they are *consistently* heavily oversubscribed, with many appeals against refusal of places each year; while other schools may sometimes hit their admission limits in a particular year, no other is heavily oversubscribed year on year in the same way. We seek to make a statistical test of the hypothesis that houses in these two catchment areas command price premia over those in surrounding areas, and to provide estimates of them where possible. Coventry is a very good LEA to use for this study[7] because it is a relatively large city containing a lot of schools to

[6] See Bradley and Taylor (1998) who examined the relationship between school size and exam results achieved by pupils in their final year of compulsory education: after controlling for other influences they estimated there to be an optimum of 1,200 pupils for 11-16 schools and 1,500 for 11-18 schools.

[7] It is also local to the University of Warwick and therefore well known to us.

which admissions are efficiently and rigorously managed by the LEA[8]. The system is transparent and its oversubscription criteria are widely understood by parents. Each school has its own defined catchment area which does not overlap with any others and therefore any possible effects on house prices are in principle easy to identify and test. Moreover, the city is compact and has less geographical heterogeneity within its boundaries than most LEAs. It also has high owner-occupation so housing market effects are likely to be well-established.

Adopting a case-study approach has some advantages over a large-scale purely statistical study based on a national sample. It takes into account specific institutional and local factors based on local knowledge enabling parameters of interest to be clearly defined. It is the only way to define parameters capturing catchment area effects. For example a study which included the neighbouring authorities of Coventry and Birmingham would be unable to do this since the LEAs operate radically different systems. Birmingham LEA, unlike Coventry, does not have unique catchment areas for secondary schools, has different oversubscription criteria and selective grammar schools. A study which included different LEAs would need to redefine the question in a more general way, for example by assuming a simple model linking a measure of school quality such as exam results and house prices within a certain distance of the school; it would not be capable of answering questions about the effects of catchment areas.

This study is confined to testing for *secondary* catchment area effects because of the particular LEA chosen. Some house price effects might be expected to exist with respect to primary schools also, especially since the introduction of the national curriculum and the publication of school performance at key Stages 1 and 2[9]. However the effects at secondary

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[8] Coventry LEA was recently praised for this by OFSTED.

[9] We might expect there to be primary school effects on house prices in areas where there was still an element of selection at 11-plus, or where the local authority operated a secondary admission policy based on "feeder schools" linked to secondaries. But neither of these is general across LEAs.

level are thought to be much stronger given the importance of GCSE and GCE A Levels. In Coventry the secondary admission arrangements give no role to a child's primary school and there are no "feeder" schools; also anecdotal evidence suggests that the hypothesised effects operate at the secondary level in Coventry. Testing for any price effects of primary schools would be difficult because admissions arrangements at the primary phase are much more complex with a greater number of voluntary-aided schools and in many cases overlapping catchment areas. Moreover the smaller size of primary schools would mean smaller sample sizes on which to base inferences.

There have been relatively few studies of schools and house prices in the UK. Cheshire and Sheppard (1998) found significant effects of secondary school catchment areas in two local authorities. A number of studies have investigated relationships between measures of school quality and house prices in surrounding areas. Rosenthal (2000) used the Nationwide Building Society database of individual house sales to study the effect of GCSE results. Gibbons and Machin (2001) study primary school effects (arguing that secondary effects are small). There have been a number of studies in the United States including Black (1999), Brasington (1999), Haurin and Brasington (1996), Gill (1983), Kain and Quigley (1970), among others.

The present paper is somewhat different in its approach in that it focuses on the effect of LEAs' admission arrangements in the face of schools' *popularity* - leaving open the reasons for the popularity - as distinct from an approach that centres on trying to model the effects of *objective* measures of school quality. This means we do not need to postulate the existence of a functional relationship between exam results and local house prices. A major objection to using such a model, where house prices depend on exam results, is that if results improve nationally (in line with the government's policy of raising standards) then this would imply a macroeconomic increase in property values. Nor is it necessary to deal with the issue of simultaneity between property values, reflecting differences in household wealth, and

exam results, reflecting differences in educational advantage related to socio-economic status, which would obviously arise as in such a study: for our purposes it is unimportant whether we believe that a popular school achieves good results because it has largely middle class students or that a school is popular because of its good results. That problem does not arise here.

If we find a catchment area premium on house prices this is consistent with different scenarios. It could be that parents recognise that the school provides a high standard of education because of good teaching – the school has high value added. Alternatively it could be that the school is popular because it does well in the exam league tables because it serves a largely educationally advantaged group of students from middle class backgrounds and parents seek to join this group partly for the educational advantages it brings.

The paper is organised as follows. First we describe the context in Coventry in terms of the public exam results of the relevant schools, the local authority's admissions policy and its operation in relation to the popular schools. Section II describes the methodology adopted to control for housing quality variation and the effects of location on prices. The latter is done by making the choice of the sample according to a designed experiment. Section III describes the sample composition, the variables used and provides summary statistics. Section IV provides the regression results, Section V gives estimates of the average effects of catchment areas on prices and Section VI concludes.

## I. Secondary School Admissions in Coventry

Apart from very minor exceptions[10] secondary education in Coventry is provided in 21 schools: two independent selective fee-paying grammer schools, four denominational comprehensives (which are maintained by the LEA: one Church of England, three Roman

[10] Such as children educated outside the city, at special schools and other private schools.

Catholic) and 15 community comprehensives. This paper is exclusively concerned with non-denominational community comprehensives; the religious schools have separate admission systems determined by the respective diocesan authorities (administered on their behalf by the local authority), the Roman Catholic schools having their own catchment areas independent of the community schools and the Church of England school serving the whole city. All schools provide education for children aged between 11 and 18. All have sixth forms and enter children for both GCSE and A level, though A levels are also provided on a consortium basis by groups of schools, and no school teaches the full range of subjects by itself. Most also offer GNVQ. Post-16 education is also provided in colleges of further education. All but two schools are co-educational, there being one all-boys and one all-girls school giving a choice of single-sex education for those parents who prefer it; these schools share their own catchment area however.

Figure 1 is a map showing all 14 catchment areas with the positions of the schools indicated. It is clear that these catchment areas do not simply consist of the houses nearest the school: given the geography of the city, there is a tendency for them to be wedge-shaped, the boundaries often following roads radiating out from the city centre. It is frequently the case that houses in other schools' areas are nearer to a school than some of its own catchment area houses[11]. The catchment areas were last substantially redrawn by the LEA in 1981, though they are reviewed annually as part of the legal obligation to review admission arrangements.

Figure 1 Secondary School Catchment Areas in Coventry

(about here)

[11] Finham Park, one of the popular schools in this investigation is an example. Some children walk through part of another school's catchment area on their way to this school.

The schools vary in popularity. This study focuses on the two that are well known for being regularly oversubscribed: Coundon Court and Finham Park. Both schools have recently been inspected by OFSTED and received praise. Both are also very firmly committed to the comprehensive principle and have stated policies of seeking to provide the best education for each child of whatever ability, rather than focussing narrowly on maximising examination results; this is undoubtedly a factor in the popularity of both.

Coundon Court has gone from being a very mediocre school some twenty years ago (and for a time it was a failing school and put under special measures by the LEA) to being successful and highly regarded today. In recent years it has substantially improved its public examination results, and done well on measures of value added and against its benchmarks. It has recently become a specialist school, having been awarded Technology College status in 1997 and been designated as a Beacon School in 2000. It is located on the edge of the urban area within sight of the Jaguar car plant and does not serve an educationally advantaged catchment area (nor a particularly disadvantaged one); nevertheless its public examination results are comparable with those of schools which do. In the words of its latest OFSTED report, “A large majority of pupils are from families of skilled or unskilled employees with traditionally strong links to the engineering and allied industries, with very few having experience of post-16 education.” Free school meal entitlement is under 10% and around 9% of pupils are from ethnic minority backgrounds.

Finham Park is on the southern boundary of the city and serves a mainly middle class community where, according to OFSTED, “Most pupils come from families whose socio-economic circumstances are above the national average but about ten percent come from less favourable backgrounds.” A significant proportion of parents are graduates and free school meal entitlement is under 5%; the proportion of ethnic minority pupils is above average, around 15%. Parental expectations are high and the school has a strong tradition of doing well in public examinations.

This study seeks to estimate any house price premia for the catchment areas of these two schools relative to their neighbours and test their statistical significance. It uses a sample of observations related to seven schools (six catchment areas) in the western half of the city based around these two; it was not thought necessary to extend it beyond this area since that would only have increased the number of observations on less popular schools, and added further complication by making it necessary to account for price variation in other districts of the city, without adding many further observations on oversubscribed schools.

Table 1: Public Exam Results for the Sample Schools

| | Number of | GCSE | | GCE Alevel | |
|---|---|---|---|---|---|
| | Pupils | Entry | %5A*-C | Entry | Av Points |
| LEA Average | | | 38 | | 16 |
| England Average | | | 47 | | 15 |
| Alderman Callow School & Community College | 523 | 96 | 19 | 7 | 13 |
| Barr's Hill School & Community College | 615 | 120 | 19 | 9 | 12 |
| Coundon Court School & Community College | 1660 | 269 | 57 | 82 | 19 |
| Finham Park School | 1478 | 228 | 63 | 123 | 19 |
| President Kennedy School & Community College | 1523 | 262 | 34 | 54 | 15 |
| Tile Hill Wood School & Language College (Girls) | 1113 | 174 | 56 | 43 | 16 |
| The Woodlands School (Boys) | 1111 | 181 | 39 | 42 | 15 |

Source DFES. Average figures 1997-2000 (rounded to nearest integer)

Table 1 shows the public examination results of the seven sample schools, taken from the DfES web site. It shows the size of the school in terms of numbers of pupils, percentage of students gaining at least five higher grades at GCSE and the average points score at GCE A level. The figures are averages over the four years 1997 to 2000. Coundon Court and Finham Park are academically strong in both sets of examinations with large entries of students doing well on average. At GCSE the results for Coventry LEA as a whole are below

the national average but Finham Park, Coundon Court and Tile Hill Wood are all well above it. At A level the average for Coventry is slightly above the national average with the best results at Coundon Court and Finham Park. Alderman Callow and Barr's Hill both have weak academic results and very small sixth forms. On the basis of academic results, as well as local knowledge, we would expect Coundon Court and Finham Park to be very popular within this group.

The local authority's statement of its admissions policy for transfer to secondary education is reproduced in Table 2 (from Coventry City Council (2000)). Where there were more requests than places available four criteria were used, in order of priority: (1) residence in the relevant catchment area; (2) an older sibling attending the school; (3) where a parent expresses a preference for single-sex education or, where the child lives in the catchment area of the single-sex schools, for a co-educational school; (4) distance from the child's residence to the school by the shortest walking route. Where it was necessary to prioritise requests within a category because of limited places, this was done with reference to distance.

Table 2: Coventry's Admissions Policy in 2000

| |
|---|
| If there are more requests for a school than there are places available within the school's admission limit, places will be allocated by preference using the criteria in priority order as follows: |
| firstly, to children who are ordinarily resident in the catchment area served by the school; |
| secondly, to children with older brothers or sisters who currently attend the school requested, |
| thirdly, to children where parents express a preference for single sex schools, or to children living in the area served by the single sex schools, whose parents express a preference of the coeducational school which is the nearest to their home (measured by the shortest available walking route), |
| fourthly, to children by reference to the distance to the preferred school. A measurement will be made, by the shortest available walking route, to the school. The shortest measurement will have the highest priority. |
| If it is not possible to meet all of the requests in any one of the categories described above, the City Council will prioritise the requests within that category by reference to distance. A single measurement will be made by the shortest available walking route to the preferred school, with places being allocated to pupils who live nearest to the school. |

Coventry City Council (2000).

This admissions policy puts parents who wish to choose a school but do not satisfy any of the four criteria at the end of the queue for places. In terms of its implications for house prices therefore we would expect, first, a catchment area effect, then, if a school became so popular that not all catchment area requests could be met, a distance effect also.

Table 3 shows the operation of this policy for admission in September 1999. It shows the popularity of the two schools mentioned with many more first preference requests received than places available. Coundon Court had 270 places for which there were 412 requests, an oversubscription of 142 while Finham Park received 317 first preference requests for 230 places, an oversubscription of 87. In both cases a large number of parents exercised their right to appeal against the initial allocation of places but inevitably enjoyed a low

success rate. However for both schools - significantly - the number of places available exceeded the number of places allocated to children *from the catchment area*. In the case of Coundon Court the number of places was all but exhausted by applicants from the catchment area plus siblings and it was therefore effectively impossible for parents from the wider city to choose that school. Nevertheless the fact that all catchment area requests could be met meant that parents could exercise choice by appropriate choice of housing location.

Table 3: Allocation of Places, September 1999

| School | Places Available | 1st Prefs Received | Successful Applicants | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Catchment Area | Siblings | Coed/ Single Sex | Distance | 2nd/3rd/4th Preference | Appeals Allowed (Held) | Total Allocated |
| Alderman Callow School & Community College | 157 | 85 | 65 | 5 | 7 | 25 | 17 | | 102 |
| Barr's Hill School & Community College | 154 | 66 | 55 | 16 | | 23 | 28 | | 94 |
| Coundon Court School & Community College | 270 | 412 | 256 | 13 | | | | 12(72) | 282 |
| Finham Part School | 230 | 317 | 188 | 32 | | 10 | | 8(40) | 238 |
| President Kennedy School & Community College | 273 | 257 | 197 | 32 | | 43 | 16 | 12(24) | 285 |
| Tile Hill Wood School & Language College (Girls) | 237 | 219 | 106 | 28 | 103 | | 18 | 5(6) | 242 |
| The Woodlands School (Boys) | 210 | 182 | 131 | 20 | 66 | | 35 | | 217 |

Source: Coventry City Council (2000)

## II. Methodology

The general approach adopted was to collect a cross-section sample of information about house sales from estate agents' advertisements in the local Property Guide. One issue of the Property Guide (July 12, 2000) published with the local newspaper, the Coventry Evening Telegraph, was used to provide all the information about house prices[12], as well as the attributes of each dwelling in terms of both its quality characteristics and its location. The street name was used to allocate each house to a catchment area using the map supplied by the LEA (Figure 1). The sample selection was organised according to an experimental design using the technique of blocking to minimise estimation bias and inefficiency. A major source of potential bias in studies of this kind is differences in the basic quality attributes of houses and this is dealt with using the well-established hedonic approach, described in the next Subsection. The sample design is described in Subsection II.2.

### II.1. Modelling Quality Differences: the Hedonic Approach

In analysing the effect of school catchment areas on prices of individual houses it is necessary to allow for the effects of variation in their specific attributes that would otherwise seriously bias the results. If one school catchment area contains mostly detached houses and another mainly terraced houses, for example, the simple difference of averages of raw prices will reflect this and give a seriously biased measure. Houses have many characteristics and it is necessary to allow for as many as possible in order to eliminate these biases. We employ the regression-based, hedonic approach to do this using the published attributes taken from estate agents' advertisements.

[12] The only prices available are the advertised prices and not actual transactions prices; in using them, we are forced to assume that the difference between them does not vary systematically in such a way as to bias the analysis. Despite this limitation, the results obtained are likely to be informative. Other sources of price data are unsuitable for this study. The Land Registry publishes on the Internet averages by housing type for each postcode sector; however this would be unsuitable for the catchment-area case-study approach because there are too few (only 30) postcode sectors in the whole of Coventry and they cut across catchment areas.

Hedonic models have been widely used for markets in which a generic differentiated commodity can embody differing amounts of a set of quality attributes. Sheppard (1999) provides an overview of its application to housing markets.[13] Rosen (1974) developed the empirical framework whereby, although the attributes assumed to comprise differentiated products are not explicitly traded on the market, their implicit marginal prices can be revealed by hedonic regressions under certain conditions. The hedonic equation is determined by the bids that consumers are willing to make for different bundles of attributes deriving from consumer value functions and the supply of those bundles by producers deriving from their offer functions, the implicit prices being determined by the equilibrium outcome. Rosen described how the model could be estimated.

Rosen's model treats the production and consumption of attributes as being simultaneous. In housing however a considerable simplification is possible enabling this generality to be relaxed because the stock of dwellings is largely fixed. New houses embodying producers' decisions on their offer functions for attributes represent an insignificant part of the total market. Therefore the hedonic approach in this case can be taken as providing estimates of consumers' bid functions and in particular giving the implicit prices of quality attributes. The hedonic equation determines how the price of a unit of the good changes with respect to the set of attributes that make up the product; it can also be used as a method for correcting prices for quality effects where such effects are not the centre of the analysis, as here[14].

[13] See also Witte et al. (1979), Palmquist (1984), Kim (1992), Gill (1983), Haurin and Brasington (1996), Black (1999) and Brasington (1999), among others.

[14] Studies aimed at estimating such implicit prices of quality attributes include Kain and Quigley (1970), Freeman (1979) (focussing on the evaluation of environmental benefits), Shinnick (1997), Dubin (1998). In recent years the hedonic approach has also been used to remove the effect of variation in quality in the computation of index numbers of house prices. (Mills and Simenauer (1996), Can and Megbolugbe (1997), Meese and Wallace (1997), Halifax (2000), Nationwide (2000)).

We assume the price of an individual dwelling, $P_i$, is a stochastic function of a set of measurable attributes, $A_{1i}$, $A_{2i}$, . . ., $A_{ri}$,

$$P_i = f(A_{1i}, A_{2i}, \ldots, A_{ri}, u_i), \qquad (1)$$

where $u_i$ is the random error term reflecting all other effects on price. We follow Freeman (1970) in dividing the attributes into two equally important groups: (1) the characteristics of the property, such as its type of construction (detached, semi-detached, terraced, flat, bungalow), its number of bedrooms and bathrooms, whether it has a garden, a garage, and so on[15]; (2) the characteristics of the neighbourhood where it is located, such as its socio-economic character in terms of the class, ethnicity, unemployment rate, crime rate, housing quality, housing tenure type (proportion of public sector or rented houses), and levels of public services, such as schools, police, transport, access to parks, accessibility of the central business district, and environmental quality such as air pollution. We are here concerned with just one neighbourhood characteristic, schools, and all other location variables are therefore of only secondary importance to the analysis and can be regarded as nuisance variables.

The general statistical approach is to specify a regression model based on equation (1):

$$f(P_i) = \sum_j \beta_j X_{ji} + \sum_j \gamma_j Z_{ji} + u_i \qquad (2)$$

where the dependent variable is a suitable transformation of price, most studies have used a logarithmic transformation, $f(P_i) = \ln(P_i)$, and we follow this practice[16]. The independent

[15] A more refined analysis would supplement information in advertisements with further particulars from estate agents and include for example floor area, age of house, and many other details. However the advertisements in the Property Guide were considered detailed enough for the analysis without any resulting omitted variable bias from this source. These variables are arguably less important in the UK than in other countries.

[16] The question of functional form for hedonic price functions has been considered by Cropper et al (1988). As well as providing a good fit, this specification has the advantage that the estimated coefficients can be regarded as premia, constant in proportional terms.

variables are appropriate functions of the attributes, partitioned into two groups: measures of the characteristics of the house, $X_{1i}$, $X_{2i}$, . . ., $X_{ki}$, and neighbourhood characteristics, $Z_{1i}$, $Z_{2i}$, . . . ,$Z_{mi}$, including measures of the popularity or quality of schools. Rather than investigate the effect of the performance measures listed in Table 1 on prices, or attempt to measure quality in some other way, we allow for schools' popularity by means of a series of dummy variables (fixed effects) for their catchment areas, as described in the next subsection.

## II.2 Sample Design: Controlling Unwanted Heterogeneity by Blocking

The usual approach is to obtain as large a sample as possible (usually from a database that has been assembled for some other purpose) and estimate a version of equation (2) for suitable choices of X's and Z's, obtaining unbiased estimates of the coefficients, including the required implicit prices attached to school catchment areas, whose dummy variables are among the Z's. A large sample size, by enabling the inclusion of a lot of explanatory variables in the model specification which would otherwise be omitted, enables bias reduction and efficiency gain – up to a point beyond which adding further observations risks adding more nuisance variables without being able to control for them.

Modelling equation (2) is difficult because of the importance of location as well as uncertainty about the specification of the functional form. The error term in equation (2) includes all other influences on house prices apart from the regressors, including those that are not quantifiable. In fact such effects can be substantial as in different areas with very different characters in terms of X's and Z's containing houses which are equally expensive for a reason which cannot be expressed as a quantity. Similarly it is possible to observe areas with similar measurable characteristics in terms of X's and Z's but different house prices because one location is fashionable and the other is not.

We adopt a different approach here by treating the collection of the data as if it were a statistical experiment and using the sample design to control these effects. We are able to do

this because of the special nature of location variables and the fact that we are not interested here in understanding how general locational factors affect prices. For our purposes we can control for location by means of fixed effects and allow for these by the use of dummy variables. This approach has previously been used by Black (1999). Moreover, *limiting* the sample size in accordance with the sample design leads to an increase in efficiency by avoiding sampling too many locations and therefore having a lot of dummy variables with little extra information about catchment area effects[17]. We use a block sample design (see for example Cox and Reid (2000)) that reduces both observed and unobserved *unwanted* heterogeneity due to location while maximising the variation *wanted* for the analysis.

The sample was designed according to the following procedure. Different locations from which to sample were chosen in the relevant geographical area which had the properties of: (1) being compact, relatively homogeneous areas with relatively little variation - within them - in locational influences on price; and (2) having more than one school catchment area in them, including one of the two popular schools, in order to enable this effect to be observed. The first property meant that all the heterogeneity between the chosen locations could reasonably be subsumed within a set of simple qualitative dummy variables. The second property provides the statistical power of the analysis by ensuring there is sufficient variation in catchment areas orthogonal to the location variables. The sample design meant that we carefully avoided taking observations from a location which was entirely within a single catchment area which would have contributed very little to the analysis.[18]

The approach can be thought of as follows. Rewrite equation (2) as:

[17] This assumes of course that there are already enough observations to estimate the coefficients of the quality characteristics efficiently.

[18] There is no point in sampling a location entirely within one school's catchment area because it would be theoretically impossible to identify the school effect separately from the location effect. Adding such observations to the sample would contribute nothing to estimating that school's catchment area effect.

$$\ln (P_i) = X_i'\beta + Z_i'\gamma + u_i \qquad i=1,2,\ldots, n \qquad (3)$$

where $X_i$ is a vector containing the relevant house characteristics and $Z_i$ a vector of appropriate location variables for house i. The effect of location in terms of observable variables is $Z_i'\gamma$. Selecting the sample according to the block design enables us to simplify this by writing:

$$Z_i'\gamma = D_i'\delta + C_i'\theta + E_i$$

where $D_i$ is a vector of location dummy variables (the dummy for the $j^{th}$ location, $D_{ji}$ equalling 1 if house i is in location j, 0 otherwise), $C_i$ a vector of analogously defined school catchment area variables and $E_i$ is the within-area effect of location on price. By appropriate choice of locations which are relatively homogeneous, the variation in $E_i$ (which now becomes part of the error term) is minimised. For this method to give unbiased estimates requires that we can assume $E_i$ uncorrelated with the variables in $X_i$, $D_i$ and $C_i$ and treat it as random. This design will also remove unobserved location effects from the error term $u_i$ substantially reducing the possibility of bias due to unobserved heterogeneity between locations. It will also reduce the variance of the error term thereby improving estimation efficiency.

The equation estimated can then be written:

$$\ln (P_i) = X_i'\beta + D_i'\delta + C_i'\theta + v_i \qquad (4)$$

and the parameters of primary interest are the catchment area coefficients $\theta$. The estimation of these parameters is improved by the use of more than one location for each school catchment area in order to gain sample size.

## III. The Sample

Three locations within Coventry were selected according to the design criteria described in the last section. Each location from which the sample was drawn was a well-defined district and therefore relatively homogenous in terms of the main locational effects on price, such as socio-economic and ethnic composition, housing tenure type and housing quality, crime rates, and so on[19].

The locations chosen were:

A. Earlsdon/Beechwood Gardens, spanning the Alderman Callow, Barrs Hill and Finham Park catchment areas;

B. Coundon/Radford, spanning the Coundon Court, Barrs Hill and President Kennedy catchment areas;

C. Allesley/Eastern Green, spanning the Coundon Court, Woodlands and Tile Hill Wood catchment areas.

It is possible to give brief descriptions of these areas using the ACORN (A Classification of Residential Neighbourhoods) profiles which classifies each postcode sector according to one of 54 standard neighbourhood profiles. Thus streets in Earlsdon in location A are described as: "mature well off suburbs", "people … are more than twice as likely as average to have a degree", "occupations tend to be those in higher socio-economic groups with a strong bias towards the professions rather than managerial employment". Streets in location B, Coundon and Radford are described by such phrases as: "proportions of professionals and managerial workers are below average", "proportions of semi-skilled and unskilled workers are above average", "white collar employment below average", "proportion of people with degrees is below average". Location C is described by phrases such as: "above average concentrations of manufacturing employment", "above average

[19] These judgements, based on local knowledge, were confirmed by discussions with a small random sample of local estate agents.

levels of white collar and skilled manual employment, but below average proportions of employment at the highest and lowest ends of the spectrum, ie professional/managerial and semi-skilled/unskilled", "the level of degrees and other academic qualifications is below average". All three of these locations are predominantly owner-occupied areas.

Table 4 shows the composition of the sample. We collected data on 248 advertised house sales distributed in the three locations, covering the six school catchment areas. The locations overlap catchment areas with two catchment areas being in two locations. Figure 2 is a map showing the three locations sampled in relation to the catchment areas. The sample excluded houses priced at over £250,000 on the assumption that comprehensive school catchment areas would be likely to be of little interest to the purchasers of such relatively expensive (at July 2000 prices) houses.

Figure 2: The Sample Locations

(about here)

The variables used are defined in Table 5 and summary statistics for them are provided in Table 6. In terms of price the most expensive location was Allesley/Eastern Green, the average house price being £113,000 and the lowest priced houses were in Coundon/Radford with an average of £70,000. These reflect differences in housing characteristics with, for example, almost 20% of the houses in the former location, but only 4% in the latter, being detached; while fewer than 17% in Allesley/Eastern Green, but more than 77% in Coundon/Radford, were terraced.

In terms of school catchment areas, these figures do not indicate any simple link between the school's popularity and house prices. The most expensive houses in the sample were in the Alderman Callow catchment area at an average of £160,000, with Finham Park

next, at £129,000. The average price of houses in the Coundon Court catchment area was £92,000. The cheapest houses were in the President Kennedy and Barrs Hill catchment areas. These figures are simple averages and take no account of the mix of the attributes of the houses and therefore tell us little about the effects we are studying; Table 6 indicates the need to adopt a hedonic approach to deal with quality effects.

Table 4: The Composition of the Sample

| School: | Location: Coundon/ Radford | Earlsdon/ Bchwd Gdns | Allesley/ E. Green | Total |
|---|---|---|---|---|
| Coundon Court | 52 | 0 | 14 | 66 |
| Alderman Callow | 0 | 16 | 0 | 16 |
| Finham Park | 0 | 35 | 0 | 35 |
| President Kennedy | 17 | 0 | 0 | 17 |
| Barr's Hill | 29 | 33 | 0 | 62 |
| Woodlands/Tile Hill Wood | 0 | 0 | 52 | 52 |
| Total | 98 | 84 | 66 | 248 |

Table 5: Definitions of Variables Used in the Analysis

| Variable Name | Code | Definition |
|---|---|---|
| Price: | P | Advertised price of the house in pounds. |
| Dwelling Type: | | |
| Detached | DET | Dummy variables taking the value |
| Semi-detached | SEMI | of 1 if the property corresponds to |
| Bungalow | BUNG | a particular type, otherwise 0. |
| Flat | FLAT | |
| Quantitative Attributes: | | |
| Number of bedrooms | NOBEDS | Actual number of bedrooms |
| Number of bathrooms | NOBATHS | Actual number of bathrooms |
| Qualitative Attributes: | | |
| Garage | GARAGE | Dummy variable taking the value of 1 if the property has a garage, otherwise 0. |
| Garden | GARDEN | Dummy variable taking the value of 1 if the property has a garden, otherwise 0. |
| Central Heating | CH | Dummy variable taking the value of 1 if the property has some type of central heating, otherwise 0. |
| Location: | | |
| Coundon/Radford | COUN/RAD | Dummy variables taking the value of 1 |
| Earlsdon/ Beechwood Gardens | EARLS/BG | according to the location in which the |
| School Catchment Area: | | |
| Barr's Hill School | BARRSH | Dummy variables taking the |
| Coundon Court School | COUNC | value of 1 according to |
| Finham Park School | FINHP | the catchment area where |
| President Kennedy | PRESK | the house is located, |
| Tile Hill Wood/ The Woodlands | THW | otherwise 0 |

Table 6: Summary Statistics by Location and School Catchment Area

| | n | Price | DET % | SEMI % | Terraced % | BUNG % | FLAT % | NOBEDS | NOBATHS | GARAGE % | GARDEN % | CH % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample: | 248 | 95,390 | 11.7 | 21.0 | 55.7 | 4.0 | 7.7 | 2.9 | 1.1 | 51.6 | 76.2 | 81.5 |
| Location: | | | | | | | | | | | | |
| Allesley/E. Green | 66 | 113,288 | 19.7 | 33.3 | 16.7 | 12.1 | 18.2 | 2.9 | 1.2 | 77.3 | 75.8 | 87.9 |
| Coundon/Radford | 98 | 70,162 | 4.1 | 14.3 | 77.6 | 0.0 | 4.1 | 2.9 | 1.0 | 51.0 | 73.5 | 75.5 |
| Earlsdon/B. G. | 84 | 110,761 | 14.3 | 19.1 | 60.7 | 2.4 | 3.6 | 2.8 | 1.1 | 32.1 | 79.8 | 83.3 |
| School Catchment Area: | | | | | | | | | | | | |
| Alderman Callow | 16 | 159,953 | 43.8 | 31.3 | 12.5 | 12.5 | 0.0 | 3.4 | 1.0 | 75.0 | 100.0 | 87.5 |
| Barr's Hill | 62 | 61,516 | 3.2 | 3.2 | 88.7 | 0.0 | 4.8 | 2.4 | 1.0 | 17.7 | 67.7 | 69.4 |
| Coundon Court | 66 | 92,562 | 9.1 | 25.8 | 59.1 | 1.5 | 4.5 | 3.0 | 1.1 | 62.1 | 77.3 | 83.3 |
| Finham Park | 35 | 129,520 | 11.4 | 31.4 | 48.6 | 0.0 | 8.6 | 3.0 | 1.2 | 40.0 | 80.0 | 94.3 |
| President Kennedy | 17 | 50,526 | 0.0 | 5.9 | 88.2 | 0.0 | 5.9 | 2.7 | 1.0 | 47.1 | 64.7 | 58.8 |
| The Woodlands/TileHW | 52 | 111,199 | 19.2 | 30.8 | 19.2 | 13.5 | 17.3 | 3.0 | 1.2 | 80.8 | 78.8 | 90.4 |

## IV. Results

Table 7 shows the results of estimating the preferred regression model by least squares.[20] The equation fits the data quite well, with an adjusted coefficient of determination of 88 percent. The attributes found to be statistically significant are the type of dwelling: detached, semi-detached, bungalow (relative to terraced houses); number of bedrooms; and whether there is a garage. Neither the presence of a garden or central heating.was statistically significant. The garage variable was found to be particularly important in Earlsdon/Beechwood Gardens; the only location in which the majority of houses did not have a garage. There was a statistically significant location dummy variable for Coundon/Radford but not Earlsdon/ Beechwood Gardens (relative to Allesley/Eastern Green).

The most interesting results, however, are the highly significant school catchment area effects for the two popular schools, as hypothesised. That is, house prices in the catchment areas of Coundon Court and Finham Park schools are significantly greater than

[20] The specification chosen was one that was robust with respect to location after a specification search. Each specification was fitted separately to each of the three locations and to the full sample. It was found that there was some variation in the coefficients and their significance between locations; the estimated value of a garage and of a garden were found to vary somewhat. Using an appropriate F test for parameter stability as a misspecification test led to the choice of a specification with a separate garage coefficient for Earlsdon/Beechwood Gardens.

The F test used is a simple extension of the usual test for parameter stability across two subsamples: in this case there are three subsamples and some variation in the set of regressor variables between them, although all are nested models. The number of restrictions is computed as follows: the number of coefficients in the three models fitted separately to the three subsamples (the unrestricted model), $k_U$, minus the number of coefficients in the model fitted to the whole combined sample (the restricted model), $k_R$. The unrestricted residual sum of squares, $RSS_u$ is equal to the sum of the respective residual sums of squares for the three subsample regressions, the restricted residual sum of squares, $RSS_R$ is that for the regresssion for the combined sample. Then, $F = (RSS_R/RSS_U - 1)(n-k_U)/(k_U-k_R)$. In this case $k_U = 33$, $k_R = 18$, $n = 248$. Therefore we base the inference on the F distribution with 15 and 215 degrees of freedom. The F statistic for the specification reported in Table 7 is 1.59 (P=0.0625), insignificant at the 5 % level.

those in the base group, the Alderman Callow catchment area, for houses with the same attributes and in the same location[21].

Table 8 shows the implied estimates of the house price premia corresponding to these coefficients. They show that a similar house would be about 20 percent more expensive if located in the Coundon Court catchment area, and 16 percent more if in the Finham Park catchment area, than if located in the Alderman Callow catchment area. Interval estimates are presented to emphasise the range of sampling uncertainty in the point estimates: a coefficient can be statistically significant but still subject to a wide range of estimation error.

In terms of the other estimated premia, a house with a given set of attributes located in the Coundon/ Radford area is 21% cheaper than if located in Allesley/ Eastern Green. Similarly, a detached house is 63 percent dearer, a Semi 33 percent and a bungalow, 80 percent dearer than a terraced house. An additional bedroom is estimated to add 28 percent to the price and a garage 3 percent, except in Earlsdon where it increases the house price on average by 17 percent.

[21] The catchment area coefficient for another school, President Kennedy, has a t statistic of -1.97, which would be statistically significant if we were to test for a price difference between two schools that were not consistently oversubscribed. Since we are not carrying out such a test, we do not regard this as a result. We would not expect there to be any house price effect since a family residing in the catchment area would be able to choose a place at any other of the schools with spare places.

However this t value may be an indication that the assumption of homogeneity within locations underlying the sample design may not be justified and indicate possible model misspecification. We tested this by means an F test for the existence of school catchment area effects between the non-oversubscribed schools. We were unable to reject the null hypothesis that there were no such effects and therefore accept the specification of the model. The details are as follows: estimating the model without the school dummies for the schools other than the popular two (that is, dropping the regressors BARRSH, PRESK and THW) gives a residual sum of squares of 5.605, while that for the unrestricted model with school effects, reported in Table 7, is 5.435. The F test statistic with 3 and 230 degrees of freedom is F=2.40 (P=0.0686) which is insignificant at the 5% level.

## V. Illustrative Examples of the Effect of School Catchment Areas on Prices

It is interesting to calculate the implied effects of the point estimates of the premia reported in the previous section for the two popular schools in terms of the scale of the differences in house prices. These are shown in Table 9 for the relevant locations. The premium for the Coundon Court catchment area was estimated at 20 percent and that for Finham Park at 16 percent. These have been applied to the average house prices in the relevant locations outside the catchment areas and the capital values they represent calculated. The Coundon Court effect for the Coundon/ Radford area is estimated at £ 10,648 and that for the Allesley/ Eastern Green area at £22,129. The corresponding Finham Park effect for the Earlsdon area is estimated at £15,773. The income equivalents of these capital sums are presented in the last column of the table, based on an assumed mortgage rate of 7%. (a typical rate when the sample was taken). A house in the Coundon Court catchment area in the Coundon or Radford area costs on average an additional £745 per year, while one in the more expensive Allesley and Eastern Green area costs an additional £1549 on average. A house in the Finham Park catchment area would cost an extra £1104 per year on average.

## VI. Conclusions

This paper reports on a local case study of the effects of secondary school admissions policies on house prices in one local education authority that uses designated catchment areas. We sought to test the hypothesis that houses in the catchment areas of certain popular and oversubscribed schools command a premium, and, if this was supported, to estimate such premia. Using a cross-section sample for Coventry we have found evidence to support the hypothesis and estimated the premia at between 16 and 20 percent for the two schools considered. These figures imply that places at the schools can be obtained through the housing market by moving house but that there is a financial cost of between about £700 and £1500 per year on average in the areas sampled in higher mortgage costs. The admissions

policy is not therefore egalitarian in the true sense of a comprehensive system and there is in practice an element of ability to pay.

We have found evidence of school catchment area effects. It is important to qualify this by being clear about what our study has not done. We have not found any relationship between measures of school quality, least of all examination results, and house prices; rather we have simply investigated the effect of school popularity in terms of parental preferences. We have interpreted the effects we have reported as results of housing location decisions, but there is no evidence on the numbers of families involved.

There is an important methodological aspect to the study in that the selection of the sample was treated as a designed experiment and bias was reduced and efficiency gained by using a block sample design (an approach previously used in American studies of schools). This contrasts somewhat with the conventional econometric approach in which it is often the case that the maximum number of observations are taken and nuisance effects removed by modelling. In the approach adopted in this paper, nuisance effects are removed by sample selection, the sample observations being limited by the sample design. This approach was followed due to the importance of locational variables in the determination of house prices.

The results of this study suggest that using quasi-market forces, with schools competing for funds, as a means of raising educational standards, a result of the Education Reform Act of 1988, is likely to meet with very limited success. Once popular schools have grown to a certain size they cannot expand further and there is little further scope for accommodating parents' choices. Therefore strong oversubscription criteria must be applied in local admission arrangements, thus removing the incentive effect on less popular schools. We have found that a by product of this is choice of school by housing choice, in effect "selection by mortgage" rather than by 11-plus.

Table 7: Estimation Results

| Dependent Variable: LNP<br>Method: Least Squares<br>Included observations: 248 | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 10.43 | 0.1124 | 92.8431 | 0.0000 |
| DET | **0.4901** | 0.0389 | 12.5934 | 0.0000 |
| SEMI | **0.2825** | 0.0358 | 7.8816 | 0.0000 |
| BUNG | **0.5876** | 0.0600 | 9.7917 | 0.0000 |
| FLAT | -0.0488 | 0.0542 | -0.9005 | 0.3688 |
| NOBEDS | **0.2441** | 0.0232 | 10.5324 | 0.0000 |
| NOBATHS | 0.0402 | 0.0409 | 0.9829 | 0.3267 |
| GARAGE | 0.0331 | 0.0229 | 1.4496 | 0.1485 |
| GARDEN | 0.0294 | 0.0231 | 1.2725 | 0.2045 |
| EARLGAR* | **0.1310** | 0.0604 | 2.1702 | 0.0310 |
| CH | 0.0079 | 0.0251 | 0.3148 | 0.7532 |
| COUNC | **0.1817** | 0.0680 | 2.6699 | 0.0001 |
| THW | 0.0103 | 0.0807 | 0.1273 | 0.8988 |
| FINHP | **0.1498** | 0.0516 | 2.9038 | 0.0611 |
| PRESK | -0.1448 | 0.0733 | -1.9739 | 0.0054 |
| BARRSH | -0.0569 | 0.0540 | -1.2447 | 0.2145 |
| COUN/RAD | **-0.2324** | 0.0480 | -4.8411 | 0.0000 |
| EARLS/BG | 0.0712 | 0.0588 | 1.2107 | 0.2273 |
| Adj R-squared | 0.8866. | F-statistic | **114.6** | 0.0000 |
| RSS | 5.4350 | | | |

(Heteroskedasticity-Consistent Standard Errors and Covariances)
*Interaction of EARLS/BG and GARAGE.

Table 8. Estimated Premia on House Prices

| Dwelling Type: | Point Estimate* | Interval Estimate** | |
|---|---|---|---|
| Detached | 63% | 51 to 76% | Relative to Terraced House |
| Semi-Detached | 33% | 23 to 42% | Relative to Terraced House |
| Bungalow | 80% | 60 to 103% | Relative to Terraced House |
| Attributes: | | | |
| Bedroom | 24% | 20 to 29% | |
| Garage (Earlsdon/Beechwood G) | 14% | 1 to 28% | |
| School Catchment Area: | | | |
| Coundon Court | 20% | 5 to 37% | Relative to Alderman Callow |
| Finham Park | 16% | 5 to 28% | Relative to Alderman Callow |
| Location: | | | |
| Coundon/ Radford | -21% | -38 to -15% | Relative to Allesley/E Green |

*The premium corresponding to a coefficient on a dummy variable when the dependent variable is a logarithm is calculated by the formula: $e^{\theta} - 1$, where $\theta$ is the coefficient. ** 95% confidence interval

Table 9: Value of Estimated School Catchment Area Premia

| School | Location | Av. Price outside area | Catchment Area Price* | Premium* (£) | Interest @ 7% (£) |
|---|---|---|---|---|---|
| Coundon Ct | Coundon/Radford | 53,510 | 64,158 | 10,648 | 745 |
| | Allesley/ Eastern Green | 111,199 | 133,328 | 22,129 | 1,549 |
| Finham Pk | Earlsdon/Beechwd Gdns | 97,362 | 113,135 | 15,773 | 1,104 |

*The effect is calculated using the premia descibed in the previous footnote. Let the average price of a house with given characteristics outside the catchment area be $P_0$, say, and that of the same house inside the catchment area be $P_1$. Then $P_1-P_0= (e^{\theta} -1)P_0$.
The actual premia used were: Coundon Court, 19.9 percent,; and Finham Park, 16.2 percent.

## References


Black, S. (1990), "Do Better Schools Matter? Parental Valuation of Elementary Education", *Quarterly Journal of Economics*, 114, 577-99.

Bradley, S. and J. Taylor (1998), "The Effect of School Size on Exam Performance in Secondary Schools", *Oxford Bulletin of Economics and Statistics*, 60(3), 291-324.

Brasington, D. (1999), "Which Measures of School Quality Does the Housing Market Measure?" *Journal of Real Estate Research*, 18 (3), 395-413.

Can, A., and I. Megbolugbe (1997), "Spatial Dependence and House Price Index," *Journal of Real Estate Finance and Economics*, Vol. 14, pp. 203-222.

Cheshire, P. and S. Sheppard (1998), "Estimating the Demand for Housing, Land and Neighbourhood Characteristics," *Oxford Bulletin of Economics and Statistics*, Vol. 60, No. 3, pp 357-82.

Coventry City Council (2000), *Transfer to Secondary Education in Coventry 2000: Information for parents of children attending Local Authority, Church of England and Catholic Primary Schools*.

Cox, D.R. and N.Reid, (2000), *The Theory of the Design of Experiments*, Chapman and Hall.

Cropper, M. L., L. B. Deck, and K. E. McConnel (1988), "On the Choice of Functional Form for Hedonic Price Functions," *Review of Economics and Statistics,* Vol. 70, Issue 4, pp. 668-675.

DfES (2001), *Code of Practice on School Admissions*, Department for Education and Employment, London, The Stationery Office, **http://www.dfes.gov.uk/sacode/**.

Dubin, R. A.(1998), "Predicting House Prices Using Multiple Listings Data," *Journal of Real Estate Finance and Economics,* Vol. 17, Issue 1. pp. 35-59.

Epple, D. (1987), "Hedonic Prices and Implicit Markets: Estimating Demand and Supply Functions for Differentiated Products," *Journal of Political Economy*, Vol. 95, Issue 1, pp. 59-80.

Freeman, A.M. (1979), "Hedonic Prices, Property Values and Measuring Environmental Benefits: a Survey of the Issues", *Scandinavian Journal of Economics*, 81(2), 154-73.

Gibbons, S. and S. Machin (2001), "Valuing Primary Schools", Working Paper, University College, London.

Gill, H.L. (1983), "Changes in City and Suburban House Prices During a Period of Expected School Desegregation", *Southern Economic Journal* 50(1), 169-84.

Halifax (2000), "House Price Index Methodology", Halifax Bank, http://www.halifax.co.uk/default.asp?PageId=782

Haurin, D.R. and D. M.Brasington (1996), "School Quality and Real House Prices: Inter- and Intrametropolitan Effects", *Journal of Housing Economics*, 5, 351-68.

Kain, J., and J. M. Quigley (1970), "Measuring the Value of Housing Quality," *Journal of the American Statistical Association,* Vol. 65, Issue 330, pp. 532-48.

Kim, S.(1992), "Search, Hedonic Prices and Housing Demand," *Review of Economics and Statistics*, Vol. 74, Issue 3, pp. 503-08.

McDonald, J.F. (1979), "Economic Analysis of an Urban Housing Market, *Academic Press*, New York, NY.

Meese, R. A., and N. E. Wallace (1997), "The Construction of Residential Housing Price Indices: A Comparison of Repeat-Sales, Hedonic-Regression and Hybrid Approaches," *Journal of Real Estate, Finance and Economics*, Vol. 14, pp. 51-73.

Mills, E. S., and R. Simenauer (1996), "New Hedonic Estimates of Regional Constant Quality House Prices," *Journal of Urban Economics*, Vol. 39, pp. 209-215.

Nationwide (2000) "Housing Price Index Methodology", Nationwide Building Society, http://www.nationwide.co.uk/hpi/method/method.htm.

Ofsted (2000), "National Summary Data Report for Secondary Schools," 2000 Data, December, Office for Standards in Education.

Palmquist, R. (1984), "Estimating the Demand for the Characteristics of Housing," *Review of Economics and Statistics*, Vol. 66, Issue 3, pp. 394-404.

Rosen, S. (1980), "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," *Journal of Political Economy*, Vol. 82, Issue 1, pp. 34-55.

Rosenthal, L. (2000), "The Value of Secondary School Quality", Department of Economics, University of Keele Working Paper No. 2000/06, October.

Sheppard, S. (1999), "Hedonic Analysis of Housing Markets", in Handbook of Regional and Urban Economics, Volume 3: Applied Urban Economics, edited by Paul Cheshire and Edwin Mills, Amsterdam, North Holland, 1595-1635.

Shinnick, E.(1997), "Measuring Irish Housing Quality," *Journal of Economic Studies*, Vol. 24, pp. 95-119.

West, A., H. Pennell and P. Noden (1998), "School Admissions: Increasing Equity, Accountability an Transparency", British Journal of Educational Studies, 46(2), June, 188-200.

White, P., S. Gorard and J.Fitz (1999), "An Analysis of Local School Admissions Arrangements", Measuring Markets: the Case of the ERA 1988, Working Paper 35, School of Social Sciences, Cardiff University.

Witte, A., H. J. Sumka, and H. Erekson (1979), "An estimation of a Structural Hedonic Prices Model of the Housing Market: An application of Rosen's Theory of Implicit Markets," *Econometrica*, Vol. 47, pp. 1151-1173.