
The Assessment of Residential Property in Allegheny County
Report 1: Sources and Quality of Data

Robert P. Strauss

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The author is Professor of Economics and Public Policy at the Heinz School, Carnegie-Mellon University, and a resident of Westmoreland County. This is the first of a series of research reports on residential property assessment in Allegheny County performed under a research contract between the author and Allegheny County. The research findings and opinions are solely those of the author.

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1 Introduction

This is the first in a series of research reports to Allegheny County on ways to improve its assessment of residential property. The International Association of Assessing Officers, the largest organization of professional appraisers, has identified ten key components to improving a real property assessment system:¹

1. Adequate budget, competent staff, and effective internal controls;
2. Complete maps and files
3. Accurate property data
4. Accurate sales data
5. Effective cost approach
6. Effective sales comparison approach
7. Effective income approach
8. Modern data processing and storage
9. Open public relations
10. Periodic assessment-ratio studies

The IAAO goes on to identify the first four as being central to achieving progress in the assessment of real property, and those relating to the accuracy of property sales data are the focus below of this report.

The virtue of a complete set of continuously updated assessment maps is that it will readily allow assessors and taxpayers to identify the size, shape, and location of real property parcel. At times of appeal, this information is especially useful to identify comparable parcels to justify particular assessments. In addition to maintaining current assessment maps, an effective assessment office must maintain, according to the IAAO, three types of information about real property: a property record file that contains the current physical descriptions of properties², a sales file³, and an ownership file.

Further, the IAAO views these data needs as being inherently dynamic, and recommends that assessors regularly receive information about building permits⁴, construction, alterations or improvements to existing structures, as well as demolitions.

As is well known, there are three general methods to assess real property:

¹IAAO(1978), p.5.

²Further, the IAAO suggests that each property be characterized by a unique parcel identifier number, street address, site characteristics, improvement characteristics, building-perimeter sketch, building permit history, sales history, (income history if relevant, record of inspections, and appeals history.

³The IAAO recommends that the sales file contain the parcel number, a physical description of sold properties as of a date of sale, sale price, assessed value, prior year appraisal, legal instrument number, address, and use code. (IAAO(1978), p. 6.

⁴IAAO(1978), p.7.

1. Examine the sales price of properties sold between independent buyers and sellers, and impute a similar sales price to similar properties which do not sell;
2. Examine the underlying construction and land cost of properties, and impute the aggregate of such costs to similar properties;
3. Examine the income generated by properties, and identify what the present-value of such income is to estimate the possible value of the property.

Each of the sales, cost, and income approaches to the valuation or appraisal of real property has its strength and weaknesses. When there is not an active market for particular types of real property, the typical situation in the case of industrial property, there may not be any local sales prices from which to make estimates of the value of properties which did not sell. On the other hand, especially in the case of residential real property, many sales between independent buyers and sellers allows one to summarize, through the use of statistical techniques, how various physical characteristics of residential properties affect their sales prices, and by implication the value of comparable (unsold) properties.

The International Association of Assessing Officers describes the sales comparison approach as:

...comparing the properties being appraised (subjects) with similar properties that have recently sold (comparable) properties or for which offers to purchase have been made. Comparable properties are selected for similarity to the subject property. Their sales prices are then adjusted for their differences from the subject. Finally, a market value for the subject is estimated from the adjusted sales prices of comparable properties.”⁵

This report is organized as follows: Section 2 describes various aspects of Allegheny County’s real property market. Section 3 provides a discussion of the kinds of physical and locational characteristics generally used to implement the sales comparison method for residential real property appraisal. Section 4 discusses the various sources of data on residential real property and transactions in Allegheny County. Section 5 provides evidence on the completeness and reliability of existing databases maintained by the Allegheny County Board of Assessments. Section 6 discusses various data capture technologies which are used and evolving to improve the completeness and quality of data on residential property. Section 7 concludes.

2 The Residential Property of Allegheny County

2.1 Numbers of Property by Property Tax Status and Land Use

At the close of calendar 1994, there were 542,505 separate properties on Allegheny County’s Board of Property Assessment, Appeals and Review (PAAR) master land and tax files of which 542,364 had a known tax status. Table 1 indicates that 4.4% were exempt from the Allegheny County real property tax, and 95.4% were taxable. (See Table 1.)

⁵IAAO(1990), p.153.

Table 1: Distribution of Real Property in Allegheny County by Tax Status

Tax Status	Properties	% Share
Exempt	23,959	4.4%
Provisionally Exempt	1,149	0.2%
Taxable	517,256	95.4%
Total	542,364	100.0%

As a result of initial efforts in the early 1980's to collect and computerize physical characteristics of these 542,364 properties, they may be cross-classified by tax status and type of land use. Table 2 indicates that the vast majority of properties are residential.⁶

Table 2: Land Use by Tax Status from 1994 CAMA Database

Landuse	Provis.			Total
	Exempt	Exempt	Taxable	
O: Unknown	47	1	1,186	1,234
A: Apartments	37	0	2,144	2,181
C: Commercial	4,330	512	17,316	22,158
F: Farm Agr.	6	0	236	242
I: Industrial	9	5	310	324
L: Vacant Land	17,270	610	61,450	79,330
R: Residential	2,175	16	414,790	416,981
T: Trailer	0	0	2,877	2,877
V: Condominium	9	0	11,907	11,916
X: Mixed Use	20	0	2,603	2,623
Total	23,903	1,144	514,819	539,866

We shall define taxable, residential property as being composed of property types 'R' and 'V' (residential and condominium); at the close of 1994 there were 428,897 such taxable, residential properties.⁷

2.2 Numbers of Properties by School District and Tax Status

Of the 542,364 properties in Allegheny County, 144,428 or 26% of them were in the City of Pittsburgh. Also, the City of Pittsburgh had 15,290 tax exempt properties in 1994, or 63.8% of all tax exempt properties in the County. (See Table 3.)

⁶It should be noted that 2,498 or .46% were not coded in terms of land use, and another 1,234 were "unknown" by virtue of having a land use code of 0 rather than an alphabetic code. Thus, a total of .69% properties had unknown land use.

⁷That is, the sum of 416,981 and 11,916 in Table 2.

Table 3: Numbers of Properties by School District and Tax Status from 1994 CAMA Database

School District	Tax Exempt	Provis. Exempt	Taxable	Total Parcels
Allegheny Valley S D	124	16	4,972	5,112
Avonworth S D	123	7	3,666	3,796
Baldwin Whitehall S D	158	24	13,941	14,123
Bethel Park S D	157	19	12,525	12,701
Brentwood Boro S D	44	4	3,746	3,794
Carlynton S D	222	13	5,958	6,193
Chartiers Valley S D	339	32	12,414	12,785
Clairton City S D	189	13	4,809	5,011
Cornell S D	124	7	3,372	3,503
Deer Lakes S D	133	11	6,878	7,022
Duquesne City S D	99	7	3,387	3,493
East Allegheny S D	199	22	8,454	8,675
Elizabeth Forward S D	179	27	9,533	9,739
Fox Chapel AREA S D	344	20	11,919	12,283
Gateway S D	189	30	12,276	12,495
Hampton Township S D	103	8	7,176	7,287
Highlands S D	225	14	10,040	10,279
Keystone Oaks S D	242	7	8,461	8,710
McDonald S D	5	1	242	248
Mckeesport Area S D	617	70	16,863	17,550
Montour S D	217	21	10,258	10,496
Moon Area S D	339	10	8,948	9,297
Mount Lebanon S D	196	16	11,655	11,867
North Allegheny S D	199	26	17,370	17,595
North Hills S D	255	16	16,707	16,978
Northgate S D	115	9	4,509	4,633
Penn Hills S D	348	26	20,180	20,554
Pine-Richland S D	105	12	6,702	6,819
Pittsburgh S D	15,290	332	128,616	144,238
Plum Borough S D	125	13	9,787	9,925
Quaker Valley S D	205	15	6,162	6,382
Riverview S D	78	7	3,444	3,529
Shaler Area S D	241	33	17,688	17,962
South Allegheny S D	124	15	6,383	6,522
South Fayette TWP S D	106	8	4,719	4,833
South Park S D	80	28	5,327	5,435
Steel Valley S D	200	23	7,707	7,930
Sto-Rox S D	196	17	6,142	6,355
Trafford S D	1	1	45	47
Upper St CLAIR TWP S D	106	10	7,131	7,247
West Allegheny S D	194	17	7,954	8,165
West Jefferson HILLS SD	125	34	7,890	8,049
West Mifflin AREA S D	219	42	10,398	10,659
Wilkinsburg Borough S D	230	13	7,015	7,258
Woodland Hills S D	850	54	23,887	24,791
Total	23,959	1,150	517,256	542,365

2.3 The Market for Residential Property in Allegheny County

The Sale of Real Property as a Source of Data

The sale of real property creates a legal event, the transfer of title from seller to buyer, which is first captured by the Allegheny County Recorder of Deeds. A new deed must be prepared and recorded to maintain the new owner's legal ownership of the property. At

the time of title transfer, the Recorder collects, when appropriate, the Pennsylvania Realty Transfer Tax as well as other fees related to the legal records surrounding the transfer of interests. Under the Pennsylvania Realty Transfer Tax, 1% of the "consideration" or economic value of the sale is remitted to the Pennsylvania Department of Revenue. The municipality and school district within which the property resides may levy and share a combined rate of 1% which is collected and remitted by the Recorder of Deeds; home rule jurisdictions (i.e. the City of Pittsburgh) may levy a higher rate.

The transfer of title and collection of the Realty Transfer Tax creates a number of administrative records which are shared with the PAAR which in turn indicate the general sales activity of the real estate market in Allegheny County. Table 4 shows the number of sales by type of sales, as reported by PAAR, for the period 1990-4. In 1990, PAAR identified 23,184 parcels which exchanged ownership in some manner, of which 22,849 or 98.6% were properties subject to the County real estate tax. As the economy improved into the middle of the decade, the extent of real estate activity rose; in 1994, 30,694 properties transacted, of which 99.4% were taxable. (See Table 4).⁸ Over the last five years, 138,146 of the 542,365 properties in the County, or 25.5%, were exchanged. That is, the overall turnover rate of real property in the County has been on the order of 5% per year.

Table 4: Tax Status of Sales of Any Sort by Year

Tax Status	1990	1991	1992	1993	1994	Total
Exempt	332	510	448	439	178	1907
Provisionally Exempt	3	83	1	0	1	88
Taxable	22,849	24,028	28,249	30,510	30,515	136,151
Total	23,184	24,621	28,698	30,949	30,694	138,146

Table 5 displays the land use of the *total* types of sales per year; note that because some land use classifications were missing, the totals are slightly different than in earlier tables. Over the last five years, 108,197 residential and 5,258 condominium properties were sold, or 113,455 out of the total of 428,897 residential and condominium properties identified above. This means that the average, residential turnover rate was 5.3% for the five year period, or slightly higher than for other types of properties. This implies that if one statistically models the behavior of residential sales with five years data on such transactions, one will impute to the other 75% of unsold properties values that can be used for real estate tax purposes.

These rates are comparable, although somewhat lower, than residential real estate turnover rates in other parts of the US, and probably reflect the continued sluggishness in Western Pennsylvania's general economy. DiPasquale and Wheaton(1995) estimate residential turnover rates in 1989 by examining the annual mobility of owners of single family dwellings. They found that annual mobility rates ranged from 5.8% for Philadelphia to 12.0% in Phoenix. Boston's mobility rate in 1989 was 5.5%.⁹

⁸These figures understate somewhat the total extent of sales activity as the counts are based on the last date of a transaction. To the extent a property sold repeatedly during this five year period, Tables 4-Table6 understate the number of transactions.

⁹DiPasquale and Wheaton(1995), p. 226. It should be recalled that by 1989 New England was in the midst of a very serious recession.

Table 5: Land Use of Sales of Any Sort by Year

Land Use	1990	1991	1992	1993	1994	Total
O: Not Available	19	11	32	787	185	1034
A: Apartments	112	101	109	134	151	607
C: Commercial	828	927	1,069	1,062	981	4,867
F: Farm, Agric.	7	11	15	15	14	62
I: Industrial	15	16	14	10	22	77
L: Vacant Land	17,260	3,041	2,987	2,978	2,700	14,282
R: Residential	18,362	19,125	22,990	24,231	23,489	108,197
T: Trailer	263	305	219	73	31	891
V: Condominium	815	906	1,077	1,297	1,163	5,258
X: Mixed Use	129	115	144	152	181	721
Total	23,126	24,558	28,656	30,739	28,917	135,996

A question arises whether or not the observed transactions reflect arms-length sales, that is, whether or not the observed sales prices at the time of title transfer reflect the sale between independent buyers and sellers. This is important because if the sales are not arms-length, then the sales price will be less than the "true" price, and affect the imputation of values to comparable, but unsold properties. Under the Pennsylvania Realty Transfer Tax, a variety of sales are exempt from the State tax. For example, the transmission of a property at time of death of one spouse to the surviving spouse is not a taxable event under the Pennsylvania Realty Transfer tax, although the deed must be revised to reflect the change in ownership. The perfection or correction of a deed, which sometimes occurs to correct an error, is not a taxable event under the Realty Transfer Tax, and would not be considered a sale by PAAR. Sales to industrial development authorities or a non-profit industrial development agency, or municipality are not taxable. In these instances, the "consideration" shown upon recording the deed will not be indicative of the interaction of normal buyer and seller interests. As a consequence, sales information generated by these transactions may not be useful for modeling the general operation of the real estate market.

Table 6 shows the classification of various types of sales for the period 1990-94. Of the total of 138,146 sales of any sort, 77,257 or about 56% were "Regular" or arms-length. Note that over this five year period, 36,495 transactions were "Love and Affection" which is the classification used by PARR to denote the various types of transactions which are exempt under the state Realty Transfer Tax. It should be emphasized that the first information about a sale of real property is collected by the Recorder of Deeds, and that as a practical matter, PAAR does not have any other governmental or systematic source of information (and thus data) about real property sales prices.¹⁰ An implication of Table 6 is that the residential turnover rate data that might be used for statistical modeling, and the arms-length turnover rate for the County, is smaller than 5%/year.

¹⁰This is a common circumstance, and explains why in many states the recording of deeds and assessment functions are within one local agency.

Table 6: Type of Sale by Year of Sale

Sales Type	1990	1991	1992	1993	1994	Total
0: Regular	13,551	13,598	15,762	16,576	17,770	77,257
1: Sheriff Sale	67	81	71	162	275	656
2: Pitts Trs Sale	87	190	244	231	164	916
3: Love/Affection	4,670	6,272	8,306	8,807	8,440	36,495
5: New Construction	7	183	118	373	1,454	2,135
6: Reconst	0	4	8	10	88	110
7: Interim	3	22	65	87	521	698
8: Unknown	2	2	6	12	1192	1214
9: Undeterm	4,797	4,269	4,118	4,691	790	18,665
Total	23,184	24,621	28,698	30,949	30,694	138,146

As might be expected, there are spatial variations across Allegheny County in the rate at which property turns over. Table 7 shows the number of taxable, residential properties by school district, and the ratio of number of "Regular" sales of taxable (under the real property tax) residential sales for 1990-1994. Figure 1 displays the same information for 1993 while Figure 2.3 displays the same information for 1994. Geographically, the northern western and southern suburban school districts displayed greater real estate activity than those in the Mon Valley, in Pittsburgh proper, or in the eastern suburbs.

Table 7: Sales Rates for Taxable Residential Property by School District 1990-4

School District	Res. Prop	CY90	CY91	CY92	CY93	CY94
Allegheny Valley S D	3,989	4.9%	4.2%	4.5%	5.9%	5.3%
Avonworth S D	2,874	4.9%	4.7%	6.2%	6.9%	6.2%
Baldwin Whitehall S D	12,752	3.9%	3.9%	4.8%	4.8%	4.5%
Bethel Park S D	11,348	4.7%	5.0%	6.3%	6.5%	5.0%
Brentwood Boro S D	3,452	4.1%	4.4%	5.1%	5.8%	4.9%
Carlynton S D	4,948	4.5%	4.7%	5.2%	6.0%	5.8%
Chartiers Valley S D	10,174	3.9%	4.5%	6.0%	6.0%	5.4%
Clairton City S D	3,528	3.8%	3.8%	4.9%	4.7%	6.0%
Cornell S D	2,612	4.1%	4.4%	4.5%	6.1%	5.6%
Deer Lakes S D	5,170	4.7%	4.1%	5.5%	6.2%	6.1%
Duquesne City S D	2,665	3.7%	3.8%	4.8%	5.6%	5.9%
East Allegheny S D	6,040	3.4%	3.9%	3.9%	5.1%	5.3%
Elizabeth Forward S D	6,940	3.3%	3.5%	4.3%	4.7%	4.6%
Fox Chapel AREA S D	9,796	5.2%	4.9%	5.6%	6.2%	5.9%
Gateway S D	10,512	4.5%	4.7%	6.1%	5.5%	5.5%
Hampton Township S D	5,608	5.2%	6.0%	7.2%	6.1%	5.0%
Highlands S D	8,334	3.9%	4.4%	4.7%	5.2%	5.2%
Keystone Oaks S D	7,592	4.7%	4.9%	5.4%	5.8%	5.5%
McDonald	181	2.8%	2.8%	3.9%	5.5%	6.6%
McKeesport Area S D	13,245	4.1%	4.3%	5.1%	5.4%	5.9%
Montour S D	8,241	4.8%	4.6%	5.8%	6.4%	6.0%
Moon Area S D	7,641	4.9%	5.5%	7.5%	7.6%	6.5%
Mount Lebanon S D	10,840	5.0%	5.2%	6.8%	7.4%	6.4%
North Allegheny S D	15,025	5.5%	6.4%	7.8%	8.3%	6.8%
North Hills S D	14,053	4.5%	4.9%	6.0%	7.3%	5.0%
Northgate S D	4,043	4.8%	5.2%	5.6%	6.8%	6.5%
Penn Hills S D	17,722	3.9%	4.0%	5.2%	5.3%	5.2%
Pine-Richland S D	4,594	6.0%	6.2%	7.9%	7.8%	6.5%
Pittsburgh S D	107,640	4.4%	4.5%	5.2%	5.4%	6.1%
Plum Borough S D	8,297	4.3%	4.7%	6.2%	6.8%	6.2%
Quaker Valley S D	4,824	4.9%	5.4%	6.4%	5.7%	6.6%
Riverview S D	2,970	4.5%	4.5%	5.9%	7.0%	6.3%
Shaler Area S D	15,278	3.9%	4.3%	5.3%	6.1%	5.2%
South Allegheny S D	5,271	3.3%	3.6%	4.1%	5.0%	5.0%
South Fayette TWP S D	3,637	6.8%	7.3%	8.1%	9.3%	7.0%
South Park S D	4,305	4.7%	4.9%	6.2%	6.9%	6.2%
Steel Valley S D	6,575	4.1%	4.1%	4.7%	5.0%	5.6%
Sto-Rox S D	4,861	3.9%	4.2%	5.1%	5.4%	5.4%
Trafford	24	4.2%	2.8%	17%	5.5%	6.6%
Upper St CLAIR TWP S D	6,556	5.2%	4.7%	6.8%	6.9%	5.7%
West Allegheny S D	4,806	5.7%	5.4%	6.1%	6.7%	5.8%
West Jefferson HILLS SD	6,208	4.8%	4.8%	5.7%	5.4%	4.7%
West Mifflin AREA S D	8,447	4.1%	4.0%	4.4%	4.7%	4.7%
Wilkinsburg Borough S D	5,970	4.5%	5.1%	6.1%	5.5%	6.5%
Woodland Hills S D	19,300	4.1%	4.6%	4.9%	5.7%	5.6%
Total	428,897	4.4%	4.6%	5.6%	5.9%	5.9%

3 Determinants of Residential Property Values and Typical Data Items Collected by Computerized Aided Mass Appraisal (CAMA) Systems

The collection and maintenance of information about the characteristics of each residential property is time-consuming and expensive. The characteristics of residential property can be roughly divided into:

1. the locational aspects of the land and building(s).
2. the characteristics of the land (condition of land, fauna, topology),
3. the external characteristics of the building(s); and,
4. the internal characteristics of the building(s).

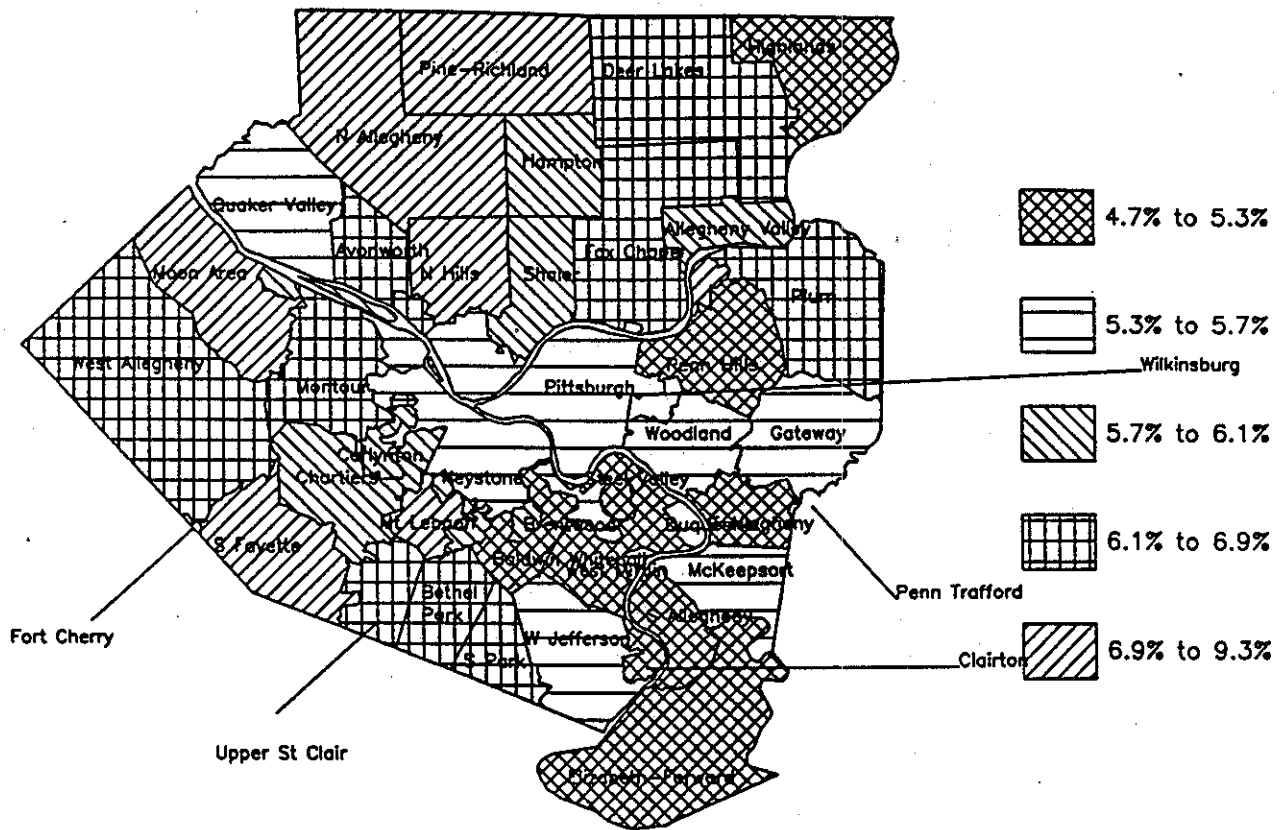
The characteristics may be classified as objective (i.e., the square feet of land, the square feet of living space in the house, the number of stories of the house etc., the test scores of students in the school district etc.), or subjective (i.e., the quality of the construction), and whether or not these objective and subjective characteristics are continuous measures (square feet) or result from classifications ("above average, average, or below average" quality for the neighborhood.) Since information is costly to collect and maintain, there are financial limits as to what can be collected about properties, and decisions must be made about which characteristics or factors are most important in determining the underlying value of the property. Implicit in any data collection effort is a theory of residential property value.

Another important aspect of any real property data collection effort involves any legal limitations or prohibitions on what a data collector or assessor may do to obtain data, and the obligations or requirements on owners to accurately report their data. As will be emphasized in this and subsequent reports, under current Pennsylvania assessment law the assessor does not have the right of entry into a property to obtain characteristics data, and real property owners in Pennsylvania are under no obligation to accurately self-report the characteristics of their properties. This is not true in other states, and the presence or absence of these two types of obligations have measurable effects on the fairness of the assessment process. The absence of entry or self-reporting requirements severely impedes the ability of the assessment process to have accurate and complete data on the characteristics of property that have sold and those which have not sold. Without complete and accurate data on characteristics of property, making inferences on the intrinsic value of various types of residential property from arms-length transactions becomes more difficult. Without reliable models of residential property values, appraisal becomes less certain.

The IAAO suggests that data collection on residential property be divided into items which can be observed in approaching the house, items which can be obtained by questioning the property owner or conducting an interior inspection, and actual measurements:

1. Items Observed:

Figure 1: Residential Turnover or Sales Rates for 1993 by School District



- story height
- style
- roof type and material
- wall type

2. Items Elicited or Obtained from Inspection

- year built/remodeled
- number of rooms, bedrooms, family rooms
- heating and cooling systems, and type of fuel
- basement type and finish
- attic finish
- fireplaces and unfinished areas
- bathrooms
- grade and condition

3. Measurements

- perimeter of house and additions
- coding of additions for type and construction such as open or enclosed porches, garage
- outbuildings

In a survey of variables measured in 20 urban areas, the IAAO found that 18 of 20 used data on building size, 14 of 20 used information on construction quality, 14 of 20 used information on age/extent of depreciation, 19 of 20 used information on other building features: number of bathrooms (12 of 20), type and size of garage (10 of 20), air conditioning (9 of 20), number of bedrooms (8 of 20), site and location (17 of 20).¹¹

¹¹See IAAO(1978), p.58.

4 Sources of Information on Allegheny County Residential Real Property

4.1 Data Sources in Pennsylvania

The Commonwealth of Pennsylvania is one of 36 states which do not provide any assistance to the local real property assessment process through the maintenance, at the state level, of systems of maps and surveys for real estate tax purposes. Among our neighboring states, New York, New Jersey, and West Virginia materially assist the local assessment process in the maintenance of tax maps and/or parcel identification.

As noted earlier, the Commonwealth through the Recorder of Deeds, does administer the Realty Transfer Tax which generates at the local level information about title transfer.

Because the Recorder of Deeds is a separately elected office, its computer systems and those of PAAR can be and are entirely separate and do not communicate with each other. As a consequence, the information which a deed transfer generates is keyed in twice: once for the Recorder of Deeds for entry into its computer systems, and once for PAAR for entry into its master land and tax files. While there is paper verification that entries by the Recorder of Deeds Office are received by the PAAR, the actual information (sales price, names of buyers and sellers etc.) from the deed transfer and collection of the Realty Transfer Tax are not cross-checked by matching computer files. Also, the Allegheny Recorder of Deeds computerization was not implemented until the mid-1980's, so its computerized database does not contain the complete historical inventory of deeds. Transactions in the Recorder's office since 1986 have been keyed.

Another aspect of these dual information systems in PARR and the Office of the Recorder of Deeds is the absence of a mutually accepted identification key of the real property itself. For assessment and property tax billing purposes through PARR, a parcel is identified by a lot and block number for ownership and tax billing purposes. However, for the purposes of the Recorder of Deeds, the primary identification key is the deed book and page number in the (paper) books of deeds. Remarkably, when PAAR computerized its records it keyed in the book and page number for all properties, and continues to do so with the result that it has a more complete set of computerized information about the inventory of real property in the County than does the Recorder's office. However, this information has not been utilized in the Office of Recorder of Deeds.¹²

Besides the activities of PAAR and Recorder of Deeds, there is a third County office

¹²Discussions with the Allegheny Recorder of Deeds indicate that this has not been a major problem for the legal community in their practice of real estate law. First, there are questions of the initial accuracy of the deed and book and page information which PAAR initially captured and continues to capture when transactions occur. Second, because it is older information, there is a question of whether it would be cost-effective to engage in checking it.

It may also be observed that the practice of real estate law would be materially impacted by the existence of a completely computerized and accurate record of every deed in the County since it would dramatically reduce the amount of time needed for title searches.

involved in certain aspects of the administration of the local real estate property tax. The Allegheny County Controller's office is responsible for the assignment of lot and block numbers for areas of the County which have not been already subdivided. Currently, at least eight municipalities do not have lot and block numbers assigned to their geographic areas, and the County utilizes a numbering system which the municipalities maintain.

While the Commonwealth obtains significant revenues from the Realty Transfer Tax, the Pennsylvania Department of Revenue does not routinely maintain a database on individual real estate transactions which can be linked with other state and federal information sources. Not only does Harrisburg not receive all individual Realty Transfer Tax returns, even if it were to, it could not match them to its personal income tax records because the Realty Transfer Tax form does not collect the social security number(s) of buyers and sellers.¹³ Under the Pennsylvania personal income tax, gain from the sale of real property is taxable as ordinary income; however, because the Recorder of Deeds does not obtain the social security number of seller and buyer, neither PAAR nor the Pennsylvania Department of Revenue has a link which permits a match with what taxpayers report to the Department of Revenue for income tax purposes, or, with federal cooperation, a match with what taxpayers report to the Internal Revenue Service when they file Federal Form 2119. It should be noted that the PAAR Master database has allocated fields on its files for social security numbers, but has not obtained them, and is of the opinion that it could not require their provision without changes in state statutes.

Recently, Minnesota, at the request of the City of St. Paul, began a program of matching state income tax records to local property sales information. There are a number of ways those involved in real estate transactions can legally report different dollar amounts for the purposes of the State Personal Income Tax, the State Realty Transfer Tax, and the local Real Estate Tax. In each instance the fact that different dollar amounts are reported have implications for current and future tax liabilities. For example, if the sale of chattel is part of the real estate transaction, then price of the realty can be reduced with beneficial effects on liability under the Realty Transfer Tax and subsequent real estate taxes. Similarly, financing and other side considerations can reduce the stated cash price of the real property with the intent to understate the overall value of the transaction to the seller.

In the extreme, the State finds on occasion that the seller of a newly constructed home forgot to include the value of the structure, and only reported the value of the land for Realty Transfer Tax purposes. However, for income tax purposes, the proceeds from the sale of the land and structure are reported. Undoubtedly, the likelihood that the IRS and the Department of Revenue will audit the income tax returns of developers improves reporting; however, at the local level and for State Realty Transfer Tax purposes, the opportunity for aggressive tax planning clearly exists.

The State Tax Equalization Board collects from each County information about sales in order to estimate, for the purposes of the administration of state aid to public education, the amount of equalized wealth per student. Since it obtains its information from the Department of Assessments, its information is not independent, and can not be used to analyze directly the quality of the real property data in the County. Moreover, the Board

¹³Phone conversation with Mr. Warren Klunk, Pennsylvania Department of Revenues.

is not interested in characteristics information other than with regard to broad type of use.

In addition to these governmental data sources, there are a variety of proprietary data sources on regional real estate markets. The West-Penn Multilist, Inc. is one such source; however, their data is not publicly available and can not be used or reported without the written permission of the corporation.¹⁴ Also, its accuracy is not known.

4.2 Federal Data Sources

Every 10 years, as part of the national Census of Population, the U.S. Bureau of the Census collects information about housing, and reports the results in various levels of geographic detail. Also, the Census Bureau obtains voluntarily information on building permits issued and new construction from municipalities with building permit systems. This information is publicly reported and is available for the major municipalities in Allegheny County.

5 Empirical Evidence on the Completeness and Reliability of Allegheny County Real Property Data

5.1 The Quantity of Real Estate Transactions

The Pennsylvania Department of Revenue's Bureau of Individual Taxes receives monthly aggregate payments of Realty Transfer Tax and other taxes and fees from each county recorder of deeds. Table 8 displays for each county the activity related to deed transfer for 1992 through 1994. The entry reflects the number of discrete writ taxes (as contrasted with Realty Transfer Taxes) collected and transmitted by each recorder of deeds. Writ taxes are levied at the rate of \$.50 per writ or document. Since a wide variety of real estate transactions are exempt from the Realty Transfer Tax, writ tax activity is the only independent state level indicator of real estate activity.¹⁵ Since more than one document can be associated with deed transfer activity, a comparison of aggregate write tax activity can only be viewed as an approximate indicator of the number of actual sales, and likely lead to an over-estimate of the number of real estate sales of any sort.

Using Realty Transfer Tax activity would also only be approximate because many real estate transactions are exempt from the tax. Here we would expect the Realty Transfer Tax to lead to an understatement of total real estate sales activity.

Table 8 indicates that something on the order of 40,000-42,000 separate writ taxes were collected in relation to deed transfer activity in Allegheny County in the early 1990's. This is far larger than the number of sales shown in Table 4 or Table 6 above. These tables show

¹⁴Phone conversation with West-Penn Multilist.

¹⁵The State Tax Equalization Board receives from each county sales information and uses it for its purposes; however, since each county provides it to the state, it is not independent verification of activity in each county.

real estate sales activity in the Department of Property Assessment records to be on the order of 28,700 to 30,900 over the same period.

Table 8: Writ Tax Activity Related to Deeds: 1992-4

County	1992	1993	1994
Adams County	2,779	2,808	2,889
Allegheny County	41,619	42,367	40,674
Armstrong County	2,273	2,042	2,181
Beaver County	5,288	5,010	5,157
Bedford County	1,861	1,650	1,654
Berks County	10,039	10,601	10,321
Blair County	4,580	4,578	4,622
Bradford County	3,219	2,904	2,803
Bucks County	127,004	138,673	118,196
Butler County	6,977	6,704	6,644
Cambria County	4,074	4,160	4,629
Cameron County	326	308	326
Carbon County	2,441	2,278	2,420
Centre County	3,461	5,232	3,325
Chester County	11,522	12,011	11,837
Clarion County	1,457	1,474	1,559
Clearfield County	3,692	3,924	4,394
Clinton County	1,310	1,282	1,257
Columbia County	1,895	1,962	2,073
Crawford County	3,183	3,441	3,450
Cumberland County	5,872	6,297	5,897
Dauphin County	6,757	7,193	6,840
Delaware County	12,555	11,462	12,242
Elk County	1,539	1,569	1,404
Eric County	7,466	7,719	7,742
Fayette County	4,393	4,731	4,921
Forest County	686	737	804
Franklin County	3,700	3,690	3,987
Fulton County	526	563	572
Greene County	1,264	1,274	1,285
Huntingdon County	1,514	1,493	1,555
Indiana County	2,675	2,297	2,471
Jefferson County	1,862	1,865	1,941
Juniata County	804	748	800
Lackawanna County	5,596	5,910	5,713
Lancaster County	95,538	97,578	81,231
Lawrence County	2,510	2,671	2,788
Lebanon County	3,131	2,997	2,830
Lehigh County	8,156	8,225	7,829
Luzerne County	8,380	8,764	8,754
Lycoming County	3,658	3,587	3,478
Mckean County	1,827	1,959	1,932
Mercer County	5,361	5,072	5,475
Mifflin County	1,454	1,399	1,390
Monroe County	7,889	7,774	7,949
Montgomery County	21,638	22,919	22,404
Montour County	519	542	509
Northampton County	6,664	7,440	6,843
Northumberland County	2,856	2,774	2,720
Perry County	1,586	2,315	1,566
Philadelphia	33,344	31,857	36,020
Pike County	4,384	4,510	4,240
Potter County	1,090	1,123	1,105
Schuylkill County	4,758	4,734	4,964
Snyder County	1,022	993	1,058
Somerset County	2,528	2,673	2,767
Sullivan County	568	519	518
Susquehanna County	2,075	7,595	2,761
Tioga County	1,554	1,594	1,587
Union County	1,224	1,163	1,144
Venango County	2,097	2,037	2,189
Warren County	1,691	1,779	1,882
Washington County	5,664	5,925	6,332
Wayne County	2,889	3,034	2,759
Westmoreland County	10,369	10,253	9,986
Wyoming County	1,053	996	951
York County	11,589	11,888	11,585
Total	557,067	579,639	540,125

5.2 Evidence on the Reliability of CAMA Land Area

A review of the PAAR CAMA data file indicates that every parcel or (lot and block number) of property has associated with it a land area measured in square feet as well as its municipality and school district. We can check the aggregate accuracy of this land

area data by adding up the CAMA land area to the municipality level, and comparing the land area to the area of each municipality as reported in the 1990 Census. Every 10 years the Geography Division of the Bureau of the Census revises its maps and boundary lines, and reports by minor civil division (municipality) its geographic area. Overall, the Census reports that Allegheny County contains about 729 square miles¹⁶, and this figure has been constant since the County's boundaries have not changed for a very long time. In general we would expect the CAMA land area to be smaller than the Census land area for the same municipality or school district, since streets and road areas will not be reflected in the CAMA property.

Table 9 aggregates the municipal land areas to school district boundaries, and reports the number of square miles of space which the CAMA property data imply and that from the 1990 Census. CAMA file's land area totals 892.7 square miles, or 122.6% of the Census Bureau's area of 727.9 square miles.¹⁷ The differences are much larger for some school districts. For example, adding up the CAMA land areas in the Carlynton School district leads to 270% of the Census estimate of square miles (compare 40.14 square miles to 19.51 square miles), and 346% for the Montour School District. On the other hand, adding up the land area of municipalities in the Avonworth School District indicates that they are only 69.2% of the Census land area estimate.

In a separate analysis of sales prices and land areas, reported below, reported land areas on the CAMA file were checked for some properties against the verbal description of the property maintained in PAAR's database. In the case of condominium property it appears that the entire area of all the condominiums was attributed to each condominium. Before development and subdivision, the land area of the overall parcel was probably correct; however, if the land area was not changed to reflect subdivision upon improvement, then each condominium could have attributed to it the larger land area. Also, it is apparent from a small sample that the error occurred with triangular parcels of land.

¹⁶See for example, US Bureau of the Census, *City County Data Book, 1994*.

¹⁷The total of the municipality figures is somewhat lower than the Census total for the County of 729 square miles due to rounding.

Table 9: Comparison of Land Area from CAMA File and 1990 Census by School District

School District	CAMA Land Area Sq. Miles	1990 Census Area Sq. Miles	CAMA/ Census (%)
Allegheny Valley S D	9.06	9.62	94.2%
Avonworth S D	7.31	10.56	69.2%
Baldwin Whitehall S D	12.51	9.61	130.2%
Bethel Park S D	18.27	11.69	156.3%
Brentwood Boro S D	1.21	1.45	83.4%
Carlynton S D	9.18	3.39	270.8%
Chartiers Valley S D	40.14	19.51	205.7%
Clairton City S D	2.53	2.76	91.7%
Cornell S D	3.49	2.67	130.7%
Deer Lakes S D	35.70	40.66	87.8%
East Allegheny S D	10.03	9.40	106.7%
Elizabeth Forward S D	42.45	41.62	102.0%
Fox Chapel AREA S D	36.50	34.88	104.6%
Gateway S D	26.78	20.31	131.9%
Hampton Township S D	14.00	16.03	87.4%
Highlands S D	30.39	21.94	138.5%
Keystone Oaks S D	9.03	4.47	202.0%
McDonald S D	0.16	0.20	80.0%
Mckeesport Area S D	16.46	12.76	129.0%
Montour S D	73.16	21.12	346.4%
Moon Area S D	29.79	25.80	115.5%
Mount Lebanon S D	6.13	6.04	101.5%
North Allegheny S D	55.98	48.53	115.4%
North Hills S D	25.58	15.37	166.4%
Northgate S D	1.35	1.63	82.8%
Penn Hills S D	25.57	19.03	134.4%
Pine-Richland S D	34.88	31.34	111.3%
Pittsburgh S D	70.14	55.96	125.3%
Plum Borough S D	34.40	28.63	120.2%
Quaker Valley S D	25.22	23.40	107.8%
Riverview S D	1.63	2.16	75.5%
Shaler Area S D	15.61	14.50	107.7%
South Allegheny S D	10.01	9.21	108.7%
South Fayette TWP S D	21.57	20.34	106.0%
South Park S D	9.02	9.17	98.4%
Steel Valley S D	3.43	3.79	90.5%
Sto-Rox S D	5.85	3.02	193.7%
Trafford S D	0.24	0.18	133.3%
Upper St CLAIR TWP S D	15.57	9.76	159.5%
West Allegheny S D	49.23	58.12	84.7%
West Jefferson Hills Sd	23.43	17.07	137.3%
West Mifflin Area S D	14.99	14.46	103.7%
Wilkesburg Borough S D	2.89	2.30	125.6%
Woodland Hills S D	11.79	13.21	89.3%
Total	892.7	727.9	122.6%

5.3 Residential Property Characteristics: Comparison of CAMA and 1990 Census Age and Bedrooms Data

The 1990 Census reports the age distribution of housing units in terms of when originally constructed, and also the number of bedrooms per housing unit. While the definition of a housing unit includes apartment buildings, and is thus broader than the owner-occupied concept used in this study, a comparison of Census and CAMA data can provide some

Table 11: Comparison of CAMA and Census Data on Number of Bedrooms

Bedrooms	CAMA	CAMA %	1990 Census	Census %
1	5,551	1.8%	84,011	14.7%
2	81,776	26.6%	168,703	29.5%
3	158,911	51.6%	227,110	39.7%
4	48,840	15.9%	72,919	12.7%
5+	12,913	4.2%	19,620	3.4%
Total	307,991	100.0%	572,363	100.0%

5.4 New Construction: Comparison of CAMA and Census Data

The Census Bureau obtains information from urban municipalities with building permit systems on new, privately owned housing units authorized. In 1993, the municipalities with building permit systems in Allegheny County voluntarily reported to Census 1,872 single private unit building permits being issued.¹⁸ Table 6 above indicated that there were 373 sales in 1993 coded as New Construction, and 1,454 sales in 1994 coded as New Construction. As was recently publicized in a local newspaper report, buyers are able to put off for up to a year the full application of local real estate taxes (county, school, and municipality taxes), by forestalling transfer until the next calendar year. However, given that 1,872 housing permits were reported for 1993 to the Federal government for purely statistical reporting purposes, questions arise about the completeness and accuracy of information on new construction and the sales of new homes.

Discussions with the Allegheny County PAAR revealed that the County has been aware of difficulties in tracking new construction. The difficulty PARR has in obtaining complete and timely information on new construction derives from the fact that municipalities within Second Class counties are not obligated under state law to report this information. Information on new construction (as well as demolitions) is not necessarily provided to the County's assessors, but depends on personal relationships developed by individual assessors and the municipalities which they are responsible for assessing.¹⁹

Last year, the County, in conjunction with the Pittsburgh Chamber of Commerce's Intergovernmental Cooperation Program, attempted to enter into voluntary agreements with municipalities with building permit systems; however, the program was never implemented,²⁰ in part because of the outstanding legal issue that municipal participation would

¹⁸US Department of Commerce, Bureau of the Census, *Housing Starts in 1992 and 1993*, Table 4, pp. 212-213.

¹⁹The author met with the Allegheny League of Municipalities and municipal officials from Mt. Lebanon, North Fayette, Whitehall, Moon Township and McCandless Township, and determined that the development of a simple mail-in postcard form, color coded respectively for new construction, demolition, and alteration, could be readily accomplished at minimal cost. Also, the post-card could be easily scanned with a personal computer to avoid manual data entry at a total development, hardware and software cost of no more than \$25,000.

²⁰See Marshall Bond, Intergovernmental Cooperation Program, Greater Pittsburgh Chamber of Commerce, *A Study of the Feasibility of a Uniform Building and Occupancy Permit Information Reporting*

indication of the accuracy of the latter's information.

Table 10 displays the number of residential properties by known year built for CAMA and the 1990 Census. Since there are 428,897 taxable residential properties in the County, it is evident that many (428,897-343,911=84,986) are missing the year of construction. Moreover, it is evident that some years of construction are simply not represented in the CAMA database. Even though the CAMA file is missing year of construction, the number of units built before 1940 are comparable between the two sources of data; compare 212,786 for CAMA and 204,655 for the 1990 Census. The data for more recent construction is very different. Census reports more than twice as many housing units built in the 1960-1969 period than does CAMA, and almost twice as many in the 1980-1984 period. The information on year of construction that is on the CAMA database does not appear, therefore, to be very reliable.

Table 10: Comparison of CAMA and Census Data on Year Built

Year Built	CAMA	CAMA %	1990 Census	Census %
Pre 1940	212,786	61.9%	204,655	35.2%
1940-49	0	0.0%	78,203	13.5%
1950-59	83,517	24.3%	110,182	19.0%
1960-69	33,584	9.8%	77,135	13.3%
1970-79	0	0.0%	66,173	11.4%
1980-84	13,984	4.1%	23,349	4.0%
1985-88	0	0.0%	16,608	2.9%
1989-1990	0	0.0%	4,430	0.8%
Total	343,911	100.0%	580,735	100.0%

Data on the number of bedrooms in the CAMA database shows a similar pattern of missing data. (See Table 11.) Only 307,991 of 428,897 residential properties have information on the number of bedrooms, or 71.8%. Of those residential properties for which there is bedroom information, the relative distribution, as compared to the Census, is somewhat similar. Observe that 26.6% of the CAMA residential properties have 2 bedrooms, while 29.5% of the Census housing units have 2 bedrooms; 15.9% of the CAMA residential properties have 4 bedrooms while 12.7% of the Census housing units have 4 bedrooms. On the other hand, 51.6% of the CAMA properties have 3 bedrooms, while 39.7% of the Census housing units have 3 bedrooms.

necessarily be voluntary unless state law were changed.

5.5 The Completeness of the CAMA File's Physical Characteristics

As noted above, we can differentiate among total square feet of land, inside characteristics, and outside characteristics of residential property. Tabulations of the Allegheny CAMA file indicate that while every property, as defined as a unique lot and block number, has associated with it the square feet of land, data on the number of square feet of living area, data on various inside characteristics, and data on various outside characteristics are not as complete.

Overall, only 1.9% of the 428,888 residential properties subject to the County real estate tax have data on the number of square feet of living area, 67.7% have positive information on internal characteristics (defined as information about the type of basement, number of bathrooms, kitchen, and bedrooms data) and 83.4% have positive information on the external characteristics of the land and improvements (defined as the exterior, neighborhood, topography of the land, and nature of surrounding property).

Table 12 displays by school district the total number of taxable residential properties for which this completeness analysis could be performed, the 1989 median household income, and the percentages of residential property with living area, inside, and outside characteristics data. The median incomes shown are weighted averages of the medians of the constituent municipality median incomes, and are from the 1990 US Bureau of Census. The most affluent, in terms of household income, school district is Upper St. Clair with a 1989 median household income of \$67,657, while the least affluent school district is Duquesne with a median 1989 household income of \$15,801. It should be remembered that half the households had total household incomes above and below each of the these household income figures.

Figures 3 and 4 show, respectively, the geographic distribution of the completeness of internal, and external data in Table 12 by school district.

It is evident that the reliability of internal and external characteristics data falls off generally in the suburbs, and that it is worst in some of the most affluent suburbs. Upper St. Clair homes have the least amount of internal and external data characteristics (32%), while Baldwin Whitehall School District homes have the most (97.5%) complete information about external characteristics.

The inverse relationship between data completeness and household income is confirmed in Table 13. While the correlation across school districts of median 1989 household income and percent of properties with living area data is inverse, it is not statistically significantly different from zero. On the other hand, the inverse correlation of $-.36$ between median household income and percent of residential properties with inside data, and the inverse correlation of $-.57$ between median household income and percentage of residential properties with external characteristics are both very statistically significant. That is, they are not due to chance or randomness, and indicate that resistance to providing information to assessment data collection efforts grows as the general income of the community grows.

System in Allegheny County, Pennsylvania, May, 1994.

(See Column [2] of Table 13.) Finally, note that the correlation between having inside and outside data across school districts is extremely high, $+0.875$. This also means that where there is little cooperation for providing outside data, there is also little cooperation for providing inside data.

Table 12: Percent of Residential Properties with Living Area, Inside, and Outside Characteristics by School District in 1994

School District	Taxable Properties	1989 Median Income	% Complete Living Area	% Complete Inside	% Complete Outside
Allegheny Valley S D	3,989	\$26,260	0.1%	70.4%	86.5%
Avonworth S D	2,874	\$44,072	0.1%	68.7%	83.9%
Baldwin Whitehall S D	12,752	\$32,891	0.0%	91.1%	97.5%
Bethel Park S D	11,348	\$41,149	0.0%	76.6%	90.0%
Brentwood Boro S D	3,452	\$27,698	0.0%	84.3%	96.7%
Carlynton S D	4,948	\$25,711	0.0%	73.4%	89.8%
Chartiers Valley S D	10,174	\$31,466	0.3%	64.7%	80.5%
Clairton City S D	3,528	\$17,396	0.0%	67.5%	90.2%
Cornell S D	2,612	\$22,130	0.0%	73.4%	91.7%
Deer Lakes S D	5,170	\$29,912	0.1%	62.4%	81.7%
Duquesne City S D	2,665	\$15,801	0.0%	76.1%	93.5%
East Allegheny S D	6,040	\$22,897	0.0%	80.3%	90.4%
Elizabeth Forward S D	6,940	\$29,442	0.0%	72.4%	90.5%
Fox Chapel AREA S D	9,796	\$48,869	0.1%	66.0%	85.1%
Gateway S D	10,512	\$34,459	0.7%	89.7%	92.8%
Hampton Township S D	5,608	\$45,538	0.1%	67.7%	83.9%
Highlands S D	8,334	\$23,862	0.0%	67.9%	86.8%
Keystone Oaks S D	7,592	\$30,541	0.0%	52.2%	66.2%
McDonald	181	\$29,205	0.0%	66.9%	89.0%
Mckeesport Area S D	13,245	\$19,512	0.0%	83.5%	93.1%
Montour S D	8,241	\$36,358	0.5%	68.8%	80.7%
Moon Area S D	7,641	\$41,250	0.5%	73.8%	83.4%
Mount Lebanon S D	10,840	\$45,801	0.0%	74.3%	92.2%
North Allegheny S D	15,025	\$52,351	1.1%	57.8%	65.2%
North Hills S D	14,053	\$34,903	0.0%	40.8%	52.5%
Northgate S D	4,043	\$23,358	0.1%	47.8%	73.2%
Penn Hills S D	17,722	\$19,719	5.0%	64.7%	84.4%
Pine-Richland S D	4,594	\$41,396	1.7%	52.0%	72.0%
Pittsburgh S D	107,640	\$20,723	6.2%	62.5%	83.8%
Plum Borough S D	8,297	\$36,782	0.1%	63.8%	83.5%
Quaker Valley S D	4,824	\$56,082	0.1%	57.5%	74.9%
Riverview S D	2,970	\$28,675	1.6%	69.4%	85.0%
Shaler Area S D	15,278	\$33,293	0.0%	65.6%	85.6%
South Allegheny S D	5,271	\$23,327	0.1%	53.7%	83.9%
South Fayette Twp S D	3,637	\$35,569	0.1%	60.8%	75.9%
South Park S D	4,305	\$37,382	0.1%	75.1%	88.5%
Steel Valley S D	6,575	\$20,832	0.0%	77.3%	92.2%
Sto-Rox S D	4,861	\$17,963	0.0%	64.1%	90.3%
Trafford	24	\$31,250	8.3%	70.8%	79.2%
Upper St Clair Twp S D	6,556	\$67,657	0.3%	32.2%	32.4%
West Allegheny S D	4,806	\$34,393	0.1%	64.9%	77.8%
West Jefferson Hills SD	6,208	\$37,547	0.5%	82.2%	91.9%
West Mifflin Area S D	8,447	\$26,677	0.2%	79.3%	95.9%
Wilkinsburg Borough S D	5,970	\$22,709	0.0%	81.3%	89.1%
Woodland Hills S D	19,300	\$26,677	0.1%	73.0%	91.0%
Total	428,888	\$28,136	1.9%	67.1%	83.4%

Table 13: Correlation Among Household Income and Data Availability Measures

(1)	Household Income (2)	Living Area (3)	Inside Data (4)	Outside Data (5)
House. Income	1.00000 [0.0]	-0.10564 [0.4898]	-0.36106 [0.0148]	-0.56916 [0.0001]
Living Area	-0.10564 [0.4898]	1.00000 [0.0]	-0.06666 [0.6635]	-0.08826 [0.5642]
Inside Data	-0.36106 [0.0148]	-0.06666 [0.6635]	1.00000 [0.0]	0.87516 [0.0001]
Outside Data	-0.56916 [0.0001]	-0.08826 [0.5642]	0.87516 [0.0001]	1.00000 [0.0]

5.6 Analysis of Residential Property Sales Prices

5.6.1 Sales Prices on Master Land File and Recorder's Check Registry File

In this section, we explore the relationship between the various prices collected by the Recorder of Deeds, and those maintained by PARR. Earlier it was noted that the property sales activity as evidenced by the collection of Writ Taxes exceeds that noted by the PAAR. This occurs for a variety of reasons. A related question arises over the real estate transaction price reported to the Recorder of Deeds and that used by PARR.

While a data tape for deed transactions in 1994 could not be provided to this project, a paper printout of the June, 1994 Check Registry was provided by the Recorder of Deeds. Any payment amount received by the Recorder of Deeds in relation to the Realty Transfer Tax is keyed in. The Deed Book and Deed Page Number are recorded, along with the Realty Transfer Tax Amount and Consideration Amount, Lot and Block Number, and a code for whether or not the transaction is Exempt from the Realty Transfer Tax. The June, 1994 data provided to the project contained 3,597 transactions.

To keep the analysis tractable, the 447 transactions in the first 11 school districts were examined of which 438 were non-temporary entries.²¹ These 438 transactions were then merged against the entire 1994 Master Land File on the basis of the Deed Book and Page Number maintained by PAAR. Of the 438, 387 were successfully merged, and 51 were not; see Table 14:

Table 15 displays the 387 matched transactions by school district. The first 3 transactions contain Land File sales prices which are different than the Consideration Amount collected by the Recorder of Deeds. In the first instance, the Consideration Amount was recorded as \$435,000 while the Realty Transfer Tax Base was \$435; if we divided \$435 by the State Realty Transfer tax rate, .01, we obtain the Land File Sales Price of \$43,500. This suggests that the Consideration Amount is probably a keypunch error. The second

²¹The Recorder follows the practice when the submission is incomplete of assigning a temporary Deed Book and Deed Page Number until the submission is complete.

Figure 3: Completeness of Inside Characteristics Data by School District

Percent Properties with Basement, Bathroom, Kitchen, Bedroom Data

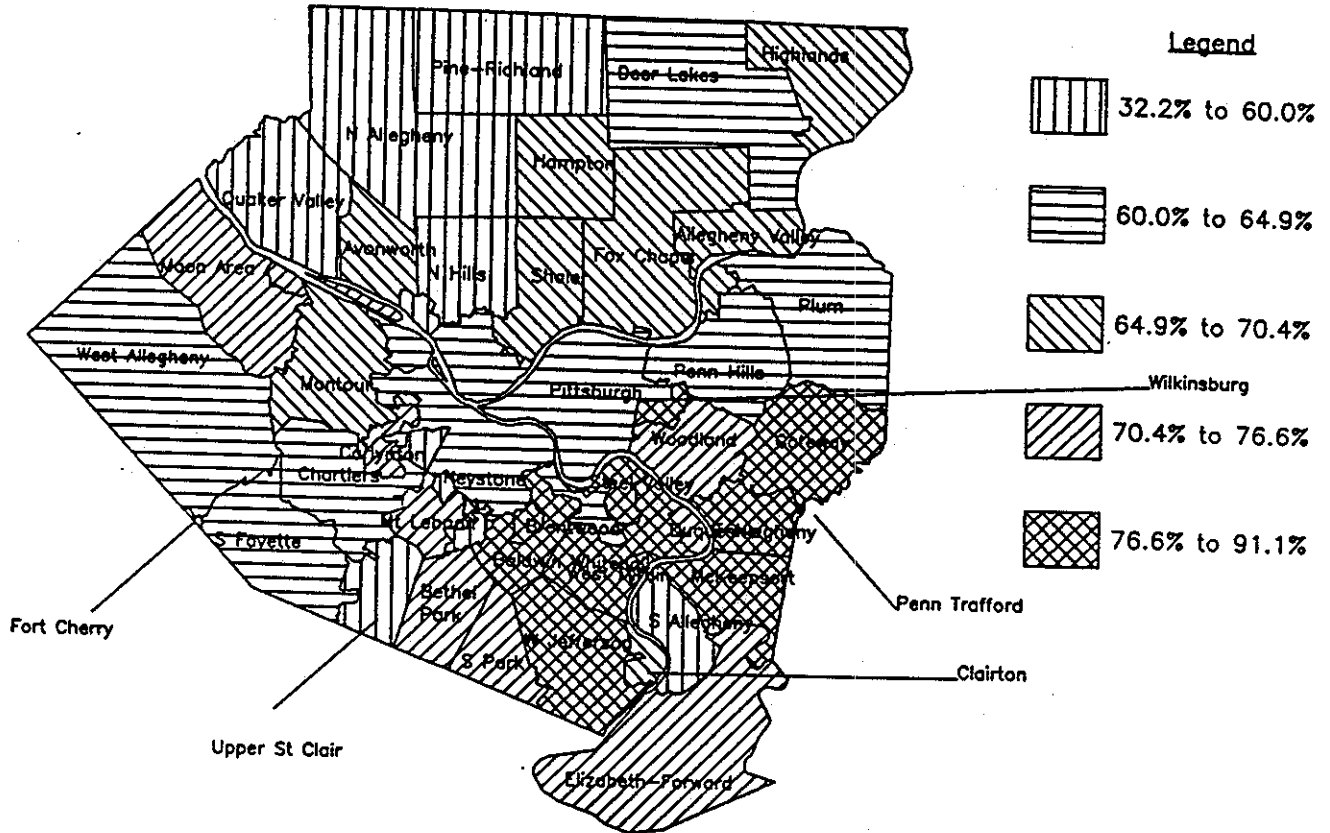
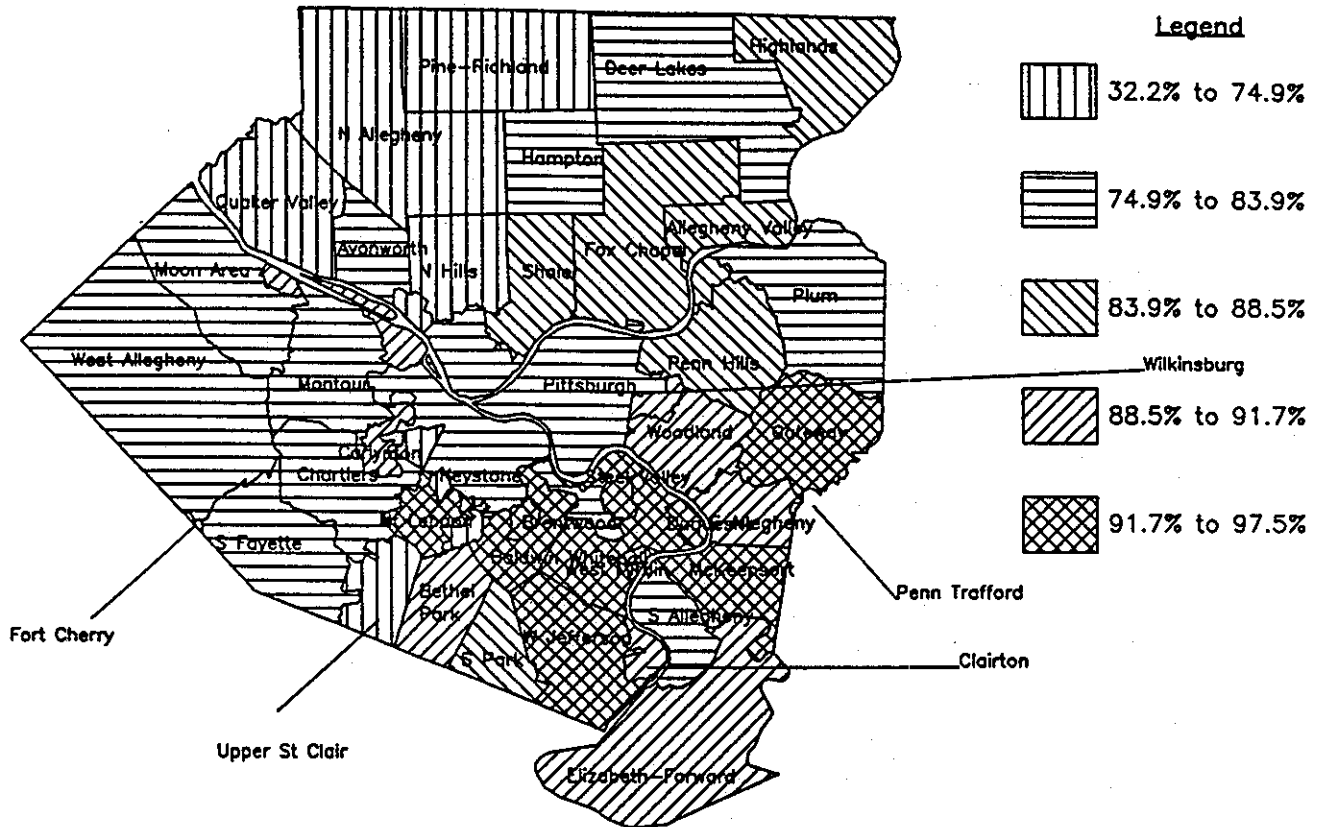


Figure 4: Completeness of External Characteristics Data by School District

Percent Properties with External Characteristics



and third observations contain Land File Sales prices which are above the Consideration Amount but consistent with the Realty Transfer Tax Base. The remainder (284) of the matched records display Land File Sales Prices which are consistent with the Consideration Amounts reported by the Recorder of Deed's Check Registry file. From this analysis, we may conclude that PAAR does a good job of obtaining the sales price information from the Realty Transfer Tax Base information which is part of the collection process by the Recorder of Deeds.

If we examine the ratio of 1994 assessed value to actual sales price, Column [7], however, we note that the actual assessment ratio varies dramatically from 25%. Transactions coded by the Department of Assessments as "7: Interim" show dramatically low assessment ratios as do transactions coded as "5: New Construction." In the second case, we can imagine that the sales price recorded could be for the land component of a new house. Observation 72, for example, sold for \$49,900 in 1994 in the Avonworth School District. Since its 1994 Assessed Value was only \$850, the actual assessment ratio was 1.7%. It is difficult to imagine that both a land and new structure would sell for \$49,900. More likely is the possibility that only the land component is reflected in the \$49,900 price. The \$850 implies an estimated market value of \$3,400 which is extremely low for even the land component of a residential property.

Table 14: Match of Recorder of Deeds June, 1994 Check Registry and 1994 Master Land File from PAAR

Recorder Code	Recorder and Land Matched	Recorder And Land Not Matched
Exempt (E)	88	23
Regular	299	28
Total	387	51

Table 15: Recorder of Deeds and PAAR Sales Prices of Matched Residential Properties in 1994

EST-1 SCHOOL=Brentwood Boro S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
1	\$435,000	R	\$435	\$43,500	\$10,900	25.1%	0:Regular

EST-2 SCHOOL=Baldwin Whitehall S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
2	\$1	R	\$770	\$77,000	\$15,000	19.5%	0:Regular

ST-2 SCHOOL=Bethel Park S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
3	\$1	R	\$3,075	\$205,000	\$39,600	19.3%	0:Regular

ST-3 SCHOOL=Allegheny Valley S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
4	\$35,000	R	\$350	\$35,000	\$6,500	18.6%	0:Regular
5	\$42,000	R	\$420	\$42,000	\$10,100	24.0%	0:Regular
6	\$103,000	R	\$1,030	\$103,000	\$23,000	22.3%	0:Regular
7	\$16,000	R	\$160	\$16,000	\$2,600	16.3%	0:Regular
8	\$64,000	R	\$640	\$64,000	\$11,000	17.2%	0:Regular
9	\$60,000	R	\$600	\$60,000	\$9,500	15.8%	0:Regular
10	\$73,000	R	\$730	\$73,000	\$15,800	21.6%	0:Regular
11	\$83,900	R	\$839	\$83,900	\$17,900	21.3%	0:Regular
12	\$155,000	R	\$1,550	\$155,000	\$34,000	21.9%	0:Regular
13	\$110,000	R	\$1,100	\$110,000	\$15,300	13.9%	0:Regular
14	\$60,000	R	\$600	\$60,000	\$9,000	15.0%	0:Regular
15	\$55,000	R	\$550	\$55,000	\$8,000	14.5%	0:Regular
16	\$51,000	R	\$0	\$51,000	\$9,500	18.6%	0:Regular
17	\$12,500	R	\$125	\$12,500	\$5,800	46.4%	0:Regular
18	\$105,000	R	\$1,050	\$105,000	\$12,350	11.8%	0:Regular
19	\$205,000	R	\$2,050	\$205,000	\$27,300	13.3%	0:Regular

ST-3 SCHOOL-Allegheny Valley S D

(continued)

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
20	\$339,000	R	\$3,399	\$339,900	\$74,500	21.9%	0:Regular
21	\$129,900	R	\$1,299	\$129,900	\$28,100	21.6%	0:Regular

ST-3 SCHOOL-Avonworth S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
22	\$80,325	R	\$803	\$80,325	\$500	0.6%	7: Interim
23	\$133,500	R	\$1,335	\$133,500	\$15,550	11.6%	0:Regular
24	\$74,500	R	\$745	\$74,500	\$12,500	16.8%	0:Regular
25	\$133,000	R	\$1,330	\$133,000	\$21,800	16.4%	0:Regular
26	\$96,100	R	\$961	\$96,100	\$900	0.9%	7: Interim
27	\$76,900	R	\$769	\$76,900	\$805	1.0%	0:Regular
28	\$68,900	R	\$689	\$68,900	\$500	0.7%	7: Interim
29	\$132,000	R	\$1,320	\$132,000	\$26,150	19.8%	0:Regular
30	\$25,000	R	\$250	\$25,000	\$1,460	5.8%	7: Interim
31	\$334,000	R	\$3,340	\$334,000	\$73,480	22.0%	0:Regular
32	\$73,000	R	\$730	\$73,000	\$10,600	14.5%	0:Regular
33	\$94,000	R	\$940	\$94,000	\$11,350	12.1%	0:Regular
34	\$87,500	R	\$875	\$87,500	\$19,450	22.2%	0:Regular
35	\$61,500	R	\$615	\$61,500	\$10,500	17.1%	0:Regular
36	\$103,500	R	\$1,035	\$103,500	\$20,500	19.8%	0:Regular
37	\$135,000	R	\$1,350	\$135,000	\$13,600	10.1%	0:Regular
38	\$80,325	R	\$803	\$80,325	\$500	0.6%	7: Interim
39	\$136,000	R	\$1,360	\$136,000	\$27,800	20.4%	0:Regular
40	\$73,000	R	\$730	\$73,000	\$11,450	15.7%	0:Regular
41	\$121,000	R	\$1,210	\$121,000	\$17,800	14.7%	0:Regular
42	\$209,000	R	\$2,090	\$209,000	\$38,150	18.3%	0:Regular
43	\$107,000	R	\$0	\$107,000	\$22,000	20.6%	0:Regular
44	\$82,500	R	\$825	\$82,500	\$12,700	15.4%	0:Regular
45	\$185,000	R	\$1,850	\$185,000	\$27,250	14.7%	0:Regular
46	\$128,500	R	\$1,285	\$128,500	\$18,550	14.4%	0:Regular
47	\$111,000	R	\$1,110	\$111,000	\$20,500	18.5%	0:Regular

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
48	\$123,000	R	\$1,538	\$123,000	\$18,000	14.6%	0:Regular
49	\$103,000	R	\$1,288	\$103,000	\$16,500	16.0%	0:Regular
50	\$67,000	R	\$838	\$67,000	\$13,300	19.9%	0:Regular
51	\$69,000	R	\$690	\$69,000	\$15,000	21.7%	0:Regular
52	\$113,000	R	\$1,413	\$113,000	\$22,500	19.9%	0:Regular
53	\$60,000	R	\$750	\$60,000	\$12,500	20.8%	0:Regular
54	\$56,600	R	\$708	\$56,600	\$14,500	25.6%	0:Regular
55	\$68,000	R	\$680	\$68,000	\$12,800	18.8%	0:Regular
56	\$85,000	R	\$850	\$85,000	\$14,500	17.1%	0:Regular
57	\$150,000	R	\$1,500	\$150,000	\$850	0.6%	7: Interim
58	\$103,500	R	\$1,294	\$103,500	\$17,000	16.4%	0:Regular
59	\$88,500	R	\$885	\$88,500	\$15,500	17.5%	0:Regular
60	\$84,000	R	\$840	\$84,000	\$16,750	19.9%	0:Regular
61	\$103,000	R	\$1,288	\$103,000	\$15,500	15.0%	0:Regular
62	\$75,000	R	\$750	\$75,000	\$14,500	19.3%	0:Regular
63	\$28,000	R	\$280	\$28,000	\$7,000	25.0%	0:Regular
64	\$112,500	R	\$1,406	\$112,500	\$18,500	16.4%	0:Regular
65	\$69,000	R	\$690	\$69,000	\$13,100	19.0%	0:Regular
66	\$86,000	R	\$860	\$86,000	\$14,750	17.2%	0:Regular
67	\$64,000	R	\$800	\$64,000	\$12,500	19.5%	0:Regular
68	\$97,000	R	\$1,213	\$97,000	\$16,250	16.8%	0:Regular
69	\$84,000	R	\$840	\$84,000	\$16,000	19.0%	0:Regular
70	\$76,000	R	\$760	\$76,000	\$12,000	15.8%	0:Regular
71	\$1	R	\$28	\$1	\$600	60000%	3:Love/ Affect.
72	\$49,900	R	\$499	\$49,900	\$850	1.7%	5: New Const
73	\$118,000	R	\$1,180	\$118,000	\$17,000	14.4%	0:Regular
74	\$82,000	R	\$820	\$82,000	\$15,250	18.6%	0:Regular
75	\$77,000	R	\$770	\$77,000	\$13,500	17.5%	0:Regular
76	\$90,000	R	\$1,125	\$90,000	\$14,750	16.4%	0:Regular
77	\$93,000	R	\$1,163	\$93,000	\$15,500	16.7%	0:Regular
78	\$80,500	R	\$805	\$80,500	\$16,500	20.5%	0:Regular
79	\$70,000	R	\$700	\$70,000	\$15,500	22.1%	0:Regular
80	\$86,000	R	\$860	\$86,000	\$14,500	16.9%	0:Regular
81	\$84,900	R	\$849	\$84,900	\$14,500	17.1%	0:Regular
82	\$125,000	R	\$1,563	\$125,000	\$16,500	13.2%	0:Regular
83	\$80,000	R	\$1,000	\$80,000	\$16,000	20.0%	0:Regular
84	\$97,000	R	\$970	\$97,000	\$16,000	16.5%	0:Regular
85	\$30,000	R	\$300	\$30,000	\$2,000	6.7%	5: New Const
86	\$66,900	R	\$669	\$66,900	\$12,000	17.9%	0:Regular
87	\$97,000	R	\$970	\$97,000	\$15,750	16.2%	0:Regular
88	\$82,500	R	\$825	\$82,500	\$18,500	22.4%	0:Regular
89	\$77,500	R	\$775	\$77,500	\$13,500	17.4%	0:Regular
90	\$85,500	R	\$855	\$85,500	\$14,800	17.3%	0:Regular

1-3 SCHOOL-Baldwin Whitehall S D (continued)

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
91	\$110,000	R	\$1,375	\$110,000	\$19,500	17.7%	0:Regular
92	\$73,000	R	\$730	\$73,000	\$15,000	20.5%	0:Regular
93	\$77,500	R	\$969	\$77,500	\$14,500	18.7%	0:Regular
94	\$73,000	R	\$730	\$73,000	\$18,500	25.3%	0:Regular
95	\$98,500	R	\$1,231	\$98,500	\$20,000	20.3%	0:Regular

1-3 SCHOOL-Bethel Park S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
96	\$165,000	R	\$2,475	\$165,000	\$29,000	17.6%	0:Regular
97	\$79,000	R	\$1,185	\$79,000	\$12,000	15.2%	0:Regular
98	\$1	R	\$55	\$1	\$800	80000%	3:Love/ Affect.
99	\$98,000	R	\$1,470	\$98,000	\$14,800	15.1%	0:Regular
100	\$83,000	R	\$1,245	\$83,000	\$14,000	16.9%	0:Regular
101	\$142,000	R	\$2,130	\$142,000	\$21,500	15.1%	0:Regular
102	\$166,000	R	\$2,490	\$166,000	\$32,000	19.3%	0:Regular
103	\$207,950	R	\$3,119	\$207,950	\$45,700	22.0%	5: New Const
104	\$142,945	R	\$2,144	\$142,945	\$25,000	17.5%	0:Regular
105	\$145,000	R	\$2,175	\$145,000	\$29,000	20.0%	0:Regular
106	\$133,000	R	\$1,995	\$133,000	\$22,900	17.2%	0:Regular
107	\$147,000	R	\$2,205	\$147,000	\$32,000	21.8%	0:Regular
108	\$66,500	R	\$0	\$66,500	\$11,450	17.2%	0:Regular
109	\$134,900	R	\$2,024	\$134,900	\$25,000	18.5%	0:Regular
110	\$100,000	R	\$1,500	\$100,000	\$15,800	15.8%	0:Regular
111	\$111,000	R	\$1,665	\$111,000	\$20,700	18.6%	0:Regular
112	\$83,000	R	\$1,245	\$83,000	\$12,500	15.1%	0:Regular
113	\$66,500	R	\$998	\$66,500	\$9,500	14.3%	0:Regular
114	\$88,500	R	\$1,328	\$88,500	\$15,400	17.4%	0:Regular
115	\$71,500	R	\$1,073	\$71,500	\$21,800	30.5%	0:Regular
116	\$129,310	R	\$1,940	\$129,310	\$30,000	23.2%	0:Regular
117	\$177,900	R	\$2,669	\$177,900	\$30,000	16.9%	0:Regular
118	\$180,000	R	\$2,700	\$180,000	\$16,550	9.2%	5: New Const
119	\$110,000	R	\$1,650	\$110,000	\$19,000	17.3%	0:Regular
120	\$98,250	R	\$1,474	\$98,250	\$15,500	15.8%	0:Regular
121	\$73,000	R	\$1,095	\$73,000	\$10,900	14.9%	0:Regular
122	\$125,000	R	\$1,875	\$125,000	\$23,000	18.4%	0:Regular
123	\$140,900	R	\$2,114	\$140,900	\$24,500	17.4%	0:Regular
124	\$84,000	R	\$1,260	\$84,000	\$14,150	16.8%	0:Regular

(continued)

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
125	\$112,750	R	\$1,691	\$112,750	\$21,600	19.2%	0:Regular
126	\$142,000	R	\$2,130	\$142,000	\$23,000	16.2%	0:Regular
127	\$131,000	R	\$1,965	\$131,000	\$22,000	16.8%	0:Regular
128	\$64,000	R	\$960	\$64,000	\$14,250	22.3%	0:Regular
129	\$97,000	R	\$1,455	\$97,000	\$15,000	15.5%	0:Regular
130	\$142,000	R	\$2,130	\$142,000	\$31,600	22.3%	0:Regular
131	\$73,000	R	\$1,095	\$73,000	\$14,000	19.2%	0:Regular
132	\$119,900	R	\$1,798	\$119,900	\$19,000	15.8%	0:Regular
133	\$162,442	R	\$2,437	\$162,442	\$35,700	22.0%	5: New Const
134	\$88,500	R	\$1,328	\$88,500	\$15,300	17.3%	0:Regular
135	\$82,000	R	\$1,230	\$82,000	\$12,600	15.4%	0:Regular
136	\$77,000	R	\$1,155	\$77,000	\$14,700	19.1%	0:Regular
137	\$32,500	R	\$488	\$32,500	\$625	1.9%	5: New Const
138	\$72,500	R	\$1,088	\$72,500	\$15,500	21.4%	0:Regular
139	\$77,900	R	\$1,169	\$77,900	\$13,000	16.7%	0:Regular
140	\$94,500	R	\$1,418	\$94,500	\$14,000	14.8%	0:Regular
141	\$114,000	R	\$1,710	\$114,000	\$17,650	15.5%	0:Regular
142	\$70,000	R	\$1,050	\$70,000	\$14,150	20.2%	0:Regular
143	\$117,000	R	\$1,755	\$117,000	\$50	0.0%	0:Regular
144	\$160,000	R	\$2,400	\$160,000	\$30,500	19.1%	0:Regular
145	\$141,500	R	\$2,123	\$141,500	\$28,700	20.3%	0:Regular
146	\$140,000	R	\$2,100	\$140,000	\$27,250	19.5%	0:Regular
147	\$160,000	R	\$2,400	\$160,000	\$30,800	19.3%	0:Regular
148	\$75,000	R	\$1,125	\$75,000	\$13,100	17.5%	0:Regular
149	\$169,000	R	\$2,535	\$169,000	\$30,000	17.8%	0:Regular

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
150	\$55,000	R	\$550	\$55,000	\$9,350	17.0%	0:Regular
151	\$115,000	R	\$0	\$115,000	\$16,000	13.9%	0:Regular
152	\$56,000	R	\$560	\$56,000	\$9,900	17.7%	0:Regular
153	\$65,000	R	\$650	\$65,000	\$12,500	19.2%	0:Regular
154	\$65,000	R	\$650	\$65,000	\$9,350	14.4%	0:Regular
155	\$25,000	R	\$250	\$25,000	\$9,350	37.4%	0:Regular
156	\$32,500	R	\$325	\$32,500	\$7,800	24.0%	0:Regular
157	\$127,000	R	\$1,270	\$127,000	\$21,850	17.2%	0:Regular
158	\$78,000	R	\$780	\$78,000	\$10,400	13.3%	0:Regular

IT-3 SCHOOL=Brentwood Boro S D

(continued)

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
159	\$45,000	R	\$450	\$45,000	\$9,900	22.0%	0:Regular
160	\$53,000	R	\$530	\$53,000	\$10,200	19.2%	0:Regular
161	\$59,500	R	\$595	\$59,500	\$9,500	16.0%	0:Regular
162	\$55,000	R	\$550	\$55,000	\$14,500	26.4%	0:Regular
163	\$84,500	R	\$845	\$84,500	\$14,550	17.2%	0:Regular
164	\$29,500	R	\$295	\$29,500	\$10,400	35.3%	0:Regular

IT-3 SCHOOL=Carlynton S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
165	\$68,500	R	\$685	\$68,500	\$14,100	20.6%	0:Regular
166	\$90,000	R	\$900	\$90,000	\$25,050	27.8%	0:Regular
167	\$74,000	R	\$740	\$74,000	\$12,300	16.6%	0:Regular
168	\$145,000	R	\$1,450	\$145,000	\$32,500	22.4%	0:Regular
169	\$222,500	R	\$2,225	\$222,500	\$37,600	16.9%	8:
170	\$57,000	R	\$570	\$57,000	\$13,200	23.2%	0:Regular
171	\$135,000	R	\$1,350	\$135,000	\$18,000	13.3%	0:Regular
172	\$50,500	R	\$505	\$50,500	\$8,250	16.3%	0:Regular
173	\$60,000	R	\$600	\$60,000	\$10,600	17.7%	0:Regular
174	\$83,000	R	\$830	\$83,000	\$10,400	12.5%	0:Regular
175	\$41,000	R	\$410	\$41,000	\$7,200	17.6%	0:Regular
176	\$65,000	R	\$650	\$65,000	\$12,700	19.5%	0:Regular
177	\$58,000	R	\$580	\$58,000	\$7,650	13.2%	0:Regular
178	\$32,000	R	\$320	\$32,000	\$5,300	16.6%	0:Regular
179	\$70,000	R	\$700	\$70,000	\$8,400	12.0%	0:Regular
180	\$90,500	R	\$905	\$90,500	\$12,250	13.5%	0:Regular
181	\$79,000	R	\$790	\$79,000	\$25,000	31.6%	0:Regular
182	\$25,000	R	\$250	\$25,000	\$8,000	32.0%	0:Regular
183	\$45,000	R	\$450	\$45,000	\$7,600	16.9%	0:Regular

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
184	\$108,000	R	\$1,080	\$108,000	\$16,800	15.6%	0:Regular
185	\$58,000	R	\$580	\$58,000	\$11,750	20.3%	0:Regular
186	\$125,000	R	\$1,250	\$125,000	\$17,450	14.0%	0:Regular
187	\$59,900	R	\$599	\$59,900	\$10,000	16.7%	3:Love/ Affect.
188	\$365,000	R	\$3,650	\$365,000	\$28,400	7.8%	5: New Const
189	\$27,000	R	\$270	\$27,000	\$2,100	7.8%	5: New Const
190	\$45,000	R	\$450	\$45,000	\$9,900	22.0%	0:Regular
191	\$63,000	R	\$630	\$63,000	\$12,500	19.8%	0:Regular
192	\$117,500	R	\$1,175	\$117,500	\$19,400	16.5%	0:Regular
193	\$107,000	R	\$1,070	\$107,000	\$13,600	12.7%	0:Regular
194	\$46,000	R	\$460	\$46,000	\$11,500	25.0%	0:Regular
195	\$200	R	\$2	\$200	\$200	100.0%	0:Regular
196	\$65,000	R	\$650	\$65,000	\$950	1.5%	3:Love/ Affect.
197	\$70,000	R	\$700	\$70,000	\$30	0.0%	5: New Const
198	\$90,500	R	\$905	\$90,500	\$15,300	16.9%	0:Regular
199	\$51,000	R	\$410	\$51,000	\$10,500	20.6%	0:Regular
200	\$188,500	R	\$1,885	\$188,500	\$36,500	19.4%	0:Regular
201	\$116,000	R	\$1,160	\$116,000	\$18,300	15.8%	0:Regular
202	\$75,000	R	\$750	\$75,000	\$14,550	19.4%	0:Regular
203	\$15,000	R	\$150	\$15,000	\$8,000	53.3%	0:Regular
204	\$87,000	R	\$870	\$87,000	\$15,050	17.3%	0:Regular
205	\$94,900	R	\$949	\$94,900	\$17,450	18.4%	0:Regular
206	\$90,000	R	\$900	\$90,000	\$10,300	11.4%	0:Regular
207	\$132,000	R	\$1,320	\$132,000	\$16,000	12.1%	0:Regular
208	\$69,000	R	\$690	\$69,000	\$12,000	17.4%	0:Regular
209	\$70,000	R	\$700	\$70,000	\$30	0.0%	5: New Const
210	\$58,700	R	\$587	\$58,700	\$5,050	8.6%	0:Regular
211	\$101,000	R	\$1,010	\$101,000	\$16,200	16.0%	0:Regular
212	\$64,900	R	\$649	\$64,900	\$12,000	18.5%	0:Regular
213	\$99,900	R	\$999	\$99,900	\$16,500	16.5%	0:Regular
214	\$100,000	R	\$1,000	\$100,000	\$450	0.5%	7: Interim
215	\$100,000	R	\$1,000	\$100,000	\$450	0.5%	7: Interim
216	\$50,000	R	\$500	\$50,000	\$4,700	9.4%	0:Regular
217	\$50,000	R	\$500	\$50,000	\$9,700	19.4%	0:Regular
218	\$154,000	R	\$1,540	\$154,000	\$26,000	16.9%	0:Regular
219	\$80,000	R	\$800	\$80,000	\$14,350	17.9%	0:Regular
220	\$89,000	R	\$890	\$89,000	\$16,000	18.0%	0:Regular
221	\$53,000	R	\$530	\$53,000	\$15,000	28.3%	0:Regular
222	\$54,000	R	\$540	\$54,000	\$9,000	16.7%	0:Regular
223	\$130,000	R	\$1,300	\$130,000	\$28,500	21.9%	0:Regular

T=3 SCHOOL=Clairton City S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
224	\$12,950	R	\$130	\$12,950	\$4,000	30.9%	0:Regular
225	\$25,000	R	\$250	\$25,000	\$8,000	32.0%	0:Regular
226	\$8,000	R	\$80	\$8,000	\$3,350	41.9%	0:Regular
227	\$12,000	R	\$120	\$12,000	\$4,000	33.3%	0:Regular
228	\$26,500	R	\$265	\$26,500	\$4,000	15.1%	0:Regular
229	\$43,000	R	\$430	\$43,000	\$7,700	17.9%	0:Regular
230	\$44,000	R	\$440	\$44,000	\$7,600	17.3%	0:Regular
231	\$5,000	R	\$50	\$5,000	\$4,600	92.0%	0:Regular
232	\$10,050	R	\$101	\$10,050	\$3,400	33.8%	0:Regular
233	\$14,900	R	\$149	\$14,900	\$4,000	26.8%	0:Regular
234	\$21,500	R	\$215	\$21,500	\$5,000	23.3%	0:Regular

T=3 SCHOOL=Cornell S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
235	\$44,000	R	\$440	\$44,000	\$7,750	17.6%	0:Regular
236	\$56,900	R	\$569	\$56,900	\$7,500	13.2%	0:Regular
237	\$69,000	R	\$690	\$69,000	\$13,000	18.8%	0:Regular
238	\$40,000	R	\$400	\$40,000	\$8,750	21.9%	0:Regular
239	\$20,000	R	\$200	\$20,000	\$4,650	23.3%	0:Regular

T=3 SCHOOL=Deer Lakes S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Assessed Value	Assessed Value/Sales Price	Land File Sales Code
240	\$28,000	R	\$420	\$28,000	\$4,800	17.1%	0:Regular
241	\$86,250	R	\$1,294	\$86,250	\$17,150	19.9%	0:Regular
242	\$111,000	R	\$1,665	\$111,000	\$19,750	17.8%	0:Regular
243	\$105,000	R	\$1,575	\$105,000	\$18,800	17.9%	0:Regular
244	\$200	R	\$3	\$200	\$200	100.0%	7: Interim
245	\$80,223	R	\$1,203	\$80,223	\$17,000	21.2%	0:Regular
246	\$30,000	R	\$450	\$30,000	\$4,800	16.0%	0:Regular
247	\$170,000	R	\$2,550	\$170,000	\$33,000	19.4%	0:Regular
248	\$11,500	R	\$115	\$11,500	\$4,000	34.8%	0:Regular
249	\$35,000	R	\$525	\$35,000	\$7,050	20.1%	0:Regular
250	\$115,850	R	\$1,738	\$115,850	\$25,000	21.6%	0:Regular
251	\$64,000	R	\$960	\$64,000	\$10,600	16.6%	0:Regular
252	\$16,000	R	\$240	\$16,000	\$120	0.8%	7: Interim
253	\$107,000	R	\$1,605	\$107,000	\$18,950	17.7%	0:Regular
254	\$141,000	R	\$2,115	\$141,000	\$20,200	14.3%	0:Regular
255	\$69,900	R	\$1,049	\$69,900	\$11,000	15.7%	0:Regular
256	\$109,900	R	\$1,649	\$109,900	\$17,500	15.9%	0:Regular
257	\$76,500	R	\$1,148	\$76,500	\$15,600	20.4%	0:Regular
258	\$24,000	R	\$240	\$24,000	\$4,300	17.9%	0:Regular
259	\$115,000	R	\$1,725	\$115,000	\$20,800	18.1%	0:Regular
260	\$125,000	R	\$1,250	\$125,000	\$10,500	8.4%	0:Regular

261	\$105,900	R	\$1,589	\$105,900	\$17,300	16.3%	0:Regular
262	\$40,000	R	\$600	\$40,000	\$7,250	18.1%	0:Regular
263	\$82,500	R	\$1,238	\$82,500	\$15,000	18.2%	0:Regular
264	\$122,000	R	\$1,830	\$122,000	\$20,000	16.4%	0:Regular

SCHOOL=Duquesne City S D

OBS	Recorder Consideration Amount	Recorder Transaction Code	Realty Transfer Tax Base	Land File Sales Price	1994 Value	Assessed Price	Sales
265	\$46,000	R	\$460	\$46,000	\$4,300	9.3%	5: New Cons
266	\$10,559	R	\$106	\$10,559	\$2,600	24.6%	0:Regular
267	\$34,200	R	\$342	\$34,200	\$5,900	17.3%	0:Regular
268	\$1,929	R	\$19	\$1,929	\$480	24.9%	0:Regular
269	\$1,929	R	\$19	\$1,929	\$480	24.9%	0 270
271	\$1,929	R	\$19	\$1,929	\$480	24.9%	0:Regular
272	\$1,929	R	\$19	\$1,929	\$480	24.9%	0:Regular
273	\$1,929	R	\$19	\$1,929	\$1,100	57.0%	0:Regular
274	\$1,929	R	\$19	\$1,929	\$480	24.9%	0:Regular
275	\$13,750	R	\$138	\$13,750	\$5,800	42.2%	0:Regular
276	\$5,400	R	\$54	\$5,400	\$4,500	83.3%	0 277

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5.6.2 Analysis of Large Residential Property Sale Prices

While independent, reliable information about residential sales prices is difficult to obtain, we may examine the plausibility of reported sales prices for properties during the period 1990-4 that vary by their observed land size. The analysis was performed as follows. Sales of properties in 1990-4 were extracted from the final 1994 Master Land File for school districts whose aggregate land area, as analyzed above was close to that estimated by the Census Bureau²², and merged to the final 1994 CAMA file which contains the Land Use code. Only residential properties coded as "Regular" or arms-length sales were extracted, and only those with a land area of between 5 and 75 acres were examined. Condominiums were excluded. Then, the resulting 126 properties were sorted from largest (73.5 acres), to smallest (5.0 acres). See Column [1] of Table 16.)

Table 16 displays the results of the analysis.

The Master Land File contains the most recent sales price coded from the paper record from the Recorder of Deeds. (See Column [2] of Table 16.) The CAMA file contains a sales price declared as the 'Valid' price which is used by PAAR and their consultant, Roger Downing, for sales ratio analysis, and which is conveyed to the State Tax Equalization Board. See Column [6] of Table 16. Column [5] of Table 16 shows the ratio of 1994 total assessed value to Column [2], the Unedited Sales Price. One way to look at this actual assessment ratio shows to see how close it is to the stated assessment ratio of 25% for the County. With a 1991 sales, it was possible in 1993, when the assessments for 1994 were constructed, to take into account this information, although it was a few years old. If the sales prices on these properties reflect arms length prices, one would expect the ratio of 1994 assessed value to sales price to be very close to 25% as there has been very little real estate inflation in the past few years. If the ratio is quite low, then the 1994 assessment did not "catch-up" with the information generated by the sale. If the ratio is quite high, then questions may have arisen about the economic realism of the sales price that came through the state Realty Transfer Tax.

Another aspect of Table 16 is the relationship between the size of the land and the sales price. For example, the second entry in Table 16 is for 70 acres plus a dwelling (recall the property has a land use of residential), and it sold for \$650,000. If there were no dwelling, and the land could be subdivided, the effective price/acre is \$9,286, which seems quite low if the land permits development. (See Column [3]).

It is evident by scanning Column [3] of Table 16 that the rough estimate of land price per acre is extremely variable. For example, a 27.0 acre property sold in 1992 in Quaker Valley School District for \$1 million which implies a cost/acre of \$38,942. While it sold in 1992, its 1994 assessment ratio was only 14.1% of the 1992 sales price.

A 24.4 acre property in Fox Chapel School District sold for \$1.5 million in 1994, and had a 1994 assessment ratio of only 10.2%. Since the 1994 assessment reflects 1993 information, it is possible that the assessment process undervalued the unsold (in 1993 property). On

²²Sales of residential property coded as "Regular" sales in the following school districts were used: Allegheny Valley, Fox Chapel, Elizabeth Forward, Mount Lebanon, Quaker Valley, West Mifflin and South Fayette.

the other hand, a 10.5 acre property sold in 1990 in the Fox Chapel School District for \$210,000, had a 87.1% assessment ratio. Were the sales price materially understated in 1990, then the ratio might be much lower than 87.1%. A smaller property, 7.8 acres, sold in Fox Chapel in 1994 for \$1.05 million while a slightly larger property, 7.9 acres, also sold in Fox Chapel for \$326,000 had an assessment ratio of 6.7%. Without knowing definitively about the character of the land and dwelling on each property, and absolutely verifying the accuracy of the land area and quality of the dwelling, it is not possible to reach firm conclusions about the veracity of these reported sales prices. However, the great variability displayed in Table 16 may well be a cause for concern about the economic reality which some reported sales prices contain.

Table 16: Sales Prices of Large (5-75 Acres) Properties in 1990-4

ACRES	Sales Price: Unedited	Unedited Sales Price/Acres	Year of Sale: Unedited	1994 AV/Unedited Sales Price	Last Sales Price (Valid)	Last Sales Year (Valid)	School Code
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
73.5	\$67,000	\$912	1994	20.3%	\$51,672	86	South Fayette TWP S D
70.0	\$650,000	\$9,286	1993	14.5%	\$84,992	79	South Fayette TWP S D
58.0	\$60,246	\$1,039	1994	66.4%	.	0	Elizabeth Forward S D
54.4	\$150,000	\$2,755	1991	21.0%	\$149,984	91	Elizabeth Forward S D
47.6	\$117,000	\$2,459	1993	3.0%	.	0	South Fayette TWP S D
43.0	\$25,000	\$582	1990	37.2%	\$25,000	90	South Fayette TWP S D
42.1	\$285,000	\$6,767	1991	21.1%	.	0	Quaker Valley S D
39.9	\$195,000	\$4,885	1990	15.4%	.	0	South Fayette TWP S D
34.1	\$280,000	\$8,200	1990	36.3%	\$280,000	90	Fox Chapel AREA S D
30.0	\$110,000	\$3,669	1991	14.1%	\$110,000	91	South Fayette TWP S D
27.0	\$1,050,000	\$38,942	1992	14.7%	\$1,049,856	92	Quaker Valley S D
26.6	\$59,665	\$2,242	1994	24.3%	.	0	Fox Chapel AREA S D
26.4	\$160,000	\$6,050	1992	42.3%	.	0	Elizabeth Forward S D
24.4	\$1,520,000	\$62,232	1994	10.2%	.	0	Fox Chapel AREA S D
24.0	\$14,000	\$584	1991	32.1%	\$14,000	91	South Fayette TWP S D
23.0	\$81,500	\$3,545	1990	24.5%	.	0	Quaker Valley S D
22.0	\$119,850	\$5,443	1991	83.4%	\$6,062	89	Fox Chapel AREA S D
18.7	\$625,000	\$33,458	1993	21.6%	\$96,000	83	Fox Chapel AREA S D
18.6	\$20,000	\$1,073	1993	22.5%	\$20,000	93	Elizabeth Forward S D
17.2	\$271,500	\$15,791	1994	21.7%	.	.	South Fayette TWP S D
16.9	\$63,000	\$3,720	1991	20.5%	\$63,000	91	Mount Lebanon S D
16.7	\$130,000	\$7,771	1993	6.4%	.	0	South Fayette TWP S D
15.6	\$84,000	\$5,402	1991	33.0%	\$84,000	91	Quaker Valley S D
15.4	\$190,000	\$12,302	1990	27.1%	\$189,984	90	Quaker Valley S D
15.2	\$75,000	\$4,942	1991	26.1%	\$74,992	91	South Fayette TWP S D
15.1	\$95,000	\$6,290	1993	19.5%	\$94,992	93	Fox Chapel AREA S D
14.3	\$260,000	\$18,210	1990	11.9%	.	0	Quaker Valley S D
14.0	\$297,000	\$21,216	1993	17.7%	.	0	Fox Chapel AREA S D
12.1	\$25,000	\$2,071	1994	11.2%	.	0	Elizabeth Forward S D
11.3	\$83,000	\$7,333	1990	10.8%	\$82,992	90	South Fayette TWP S D
11.3	\$119,000	\$10,543	1993	26.8%	\$118,992	93	Elizabeth Forward S D
11.1	\$110,000	\$9,911	1993	28.2%	.	0	West Mifflin AREA S D
11.0	\$167,500	\$15,164	1993	26.9%	.	0	Quaker Valley S D
11.0	\$521,790	\$47,264	1992	22.6%	\$521,728	92	Quaker Valley S D
10.5	\$210,000	\$20,021	1990	87.1%	\$209,984	90	Fox Chapel AREA S D
10.4	\$45,000	\$4,327	1991	33.3%	\$45,000	91	Quaker Valley S D
10.4	\$1,050,000	\$101,255	1993	22.4%	\$1,049,856	93	Quaker Valley S D
10.1	\$1,000,000	\$99,188	1993	25.0%	\$999,936	93	Quaker Valley S D
10.1	\$1,100,000	\$109,218	1991	23.6%	\$424,960	86	Quaker Valley S D
10.0	\$190,000	\$18,937	1992	37.4%	\$189,984	92	Fox Chapel AREA S D
10.0	\$720,000	\$71,929	1992	17.4%	\$720,000	92	Quaker Valley S D
10.0	\$85,000	\$8,500	1990	28.0%	\$84,992	90	Fox Chapel AREA S D
10.0	\$63,500	\$6,350	1990	23.6%	\$63,496	90	Elizabeth Forward S D
10.0	\$250,000	\$25,001	1990	22.0%	.	0	Fox Chapel AREA S D
9.9	\$60,000	\$6,043	1992	33.3%	\$60,000	92	Allegheny Valley S D
9.8	\$1,200,000	\$122,341	1990	21.8%	.	0	Quaker Valley S D
9.4	\$420,000	\$44,645	1994	10.1%	.	0	Fox Chapel AREA S D

ACRES	Sales Price: Unedited	Unedited Sales Price/Acres	Year of Sale: Unedited	1994 AV/Unedited Sales Price	Last Sales Price (Valid)	Last Sales Year (Valid)	School Code
{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}
9.3	\$950,000	\$102,488	1991	23.0%	.	0	Fox Chapel AREA S D
9.3	\$295,000	\$31,891	1994	25.4%	.	0	Quaker Valley S D
9.0	\$80,000	\$8,854	1993	30.6%	\$80,000	93	Quaker Valley S D
9.0	\$185,500	\$20,543	1994	36.9%	.	0	Quaker Valley S D
9.0	\$390,000	\$43,338	1993	19.2%	\$389,952	93	Elizabeth Forward S D
8.6	\$178,000	\$20,590	1992	16.4%	\$177,984	92	Fox Chapel AREA S D
8.6	\$157,000	\$18,279	1992	20.1%	\$156,992	92	Quaker Valley S D
8.3	\$485,000	\$58,343	1990	22.2%	\$484,992	90	Fox Chapel AREA S D
8.3	\$465,000	\$56,265	1994	21.5%	\$381,440	87	Quaker Valley S D
8.0	\$565,000	\$70,625	1991	25.3%	.	0	Quaker Valley S D
7.9	\$326,000	\$41,067	1994	6.7%	.	0	Fox Chapel AREA S D
7.8	\$1,050,000	\$133,781	1994	11.9%	.	0	Fox Chapel AREA S D
7.8	\$23,000	\$2,949	1990	24.3%	\$23,000	90	Elizabeth Forward S D
7.7	\$425,000	\$55,362	1993	22.6%	\$424,960	93	Quaker Valley S D
7.6	\$275,000	\$36,210	1992	20.0%	\$170,976	86	Fox Chapel AREA S D
7.6	\$440,000	\$58,038	1993	23.2%	\$440,000	93	Fox Chapel AREA S D
7.3	\$540,000	\$73,981	1991	21.8%	.	0	Fox Chapel AREA S D
7.2	\$30,000	\$4,158	1991	22.2%	\$30,000	91	Elizabeth Forward S D
7.1	\$565,000	\$79,965	1994	21.2%	.	0	Quaker Valley S D
7.0	\$127,000	\$18,035	1994	10.7%	.	0	South Fayette TWP S D
7.0	\$469,178	\$67,031	1994	22.4%	\$314,944	87	Quaker Valley S D
7.0	\$36,000	\$5,143	1992	22.2%	\$36,000	92	Quaker Valley S D
6.9	\$30,000	\$4,370	1993	25.0%	\$30,000	93	Quaker Valley S D
6.8	\$600,000	\$87,615	1991	22.9%	.	0	Fox Chapel AREA S D
6.7	\$469,500	\$69,559	1990	22.9%	\$469,440	90	Fox Chapel AREA S D
6.7	\$560,753	\$83,570	1993	25.0%	\$560,640	93	Quaker Valley S D
6.7	\$920,500	\$137,364	1992	17.9%	\$324,992	86	Fox Chapel AREA S D
6.7	\$620,000	\$92,683	1994	21.3%	\$485,952	88	Quaker Valley S D
6.7	\$355,500	\$53,343	1991	17.4%	\$355,456	91	Quaker Valley S D
6.4	\$242,000	\$37,700	1992	20.9%	\$241,984	92	Fox Chapel AREA S D
6.4	\$106,000	\$16,563	1991	21.2%	\$106,000	91	Elizabeth Forward S D
6.4	\$875,000	\$137,508	1993	14.3%	\$874,880	93	Fox Chapel AREA S D
6.3	\$540,000	\$86,115	1990	25.0%	\$221,984	85	Quaker Valley S D
6.2	\$650,000	\$104,860	1993	26.9%	\$649,984	93	Quaker Valley S D
6.2	\$329,000	\$53,278	1991	23.7%	\$328,960	91	Fox Chapel AREA S D
6.2	\$438,100	\$71,097	1994	34.6%	\$374,976	87	Quaker Valley S D
6.0	\$15,000	\$2,480	1991	26.7%	\$15,000	91	Elizabeth Forward S D
6.0	\$700,000	\$116,688	1992	25.0%	\$699,904	92	Fox Chapel AREA S D
6.0	\$268,000	\$44,840	1990	62.7%	.	0	Fox Chapel AREA S D
6.0	\$885,000	\$148,564	1992	23.6%	.	0	Quaker Valley S D
5.9	\$437,500	\$74,406	1994	23.8%	\$315,968	85	Quaker Valley S D
5.8	\$445,000	\$76,205	1990	31.5%	\$444,992	90	Quaker Valley S D
5.8	\$900,000	\$154,707	1991	23.6%	.	0	Quaker Valley S D
5.8	\$144,900	\$24,999	1990	20.3%	\$144,896	90	South Fayette TWP S D
5.8	\$127,500	\$22,138	1990	21.2%	\$127,488	90	Quaker Valley S D
5.7	\$575,000	\$100,118	1994	21.9%	.	0	Fox Chapel AREA S D
5.7	\$63,000	\$11,034	1993	22.9%	\$63,000	93	South Fayette TWP S D

ACRES	Sales Price: Unedited	Unedited Sales Price/Acres	Year of Sale: Unedited	1994 AV/Unedited Sales Price	Last Sales Price (Valid)	Last Sales Year (Valid)	School Code
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
5.6	\$760,000	\$135,288	1991	23.0%	.	0	Quaker Valley S D
5.6	\$205,000	\$36,713	1994	49.8%	\$309,952	87	Quaker Valley S D
5.5	\$970,000	\$177,023	1991	22.7%	\$209,984	78	Quaker Valley S D
5.5	\$85,000	\$15,514	1991	21.1%	\$84,992	91	Fox Chapel AREA S D
5.5	\$115,000	\$21,044	1991	19.6%	\$114,992	91	Fox Chapel AREA S D
5.5	\$103,000	\$18,863	1991	20.2%	\$102,992	91	Fox Chapel AREA S D
5.5	\$107,000	\$19,611	1991	21.5%	\$106,992	91	Elizabeth Forward S D
5.4	\$95,000	\$17,511	1993	13.9%	\$94,992	93	South Fayette TWP S D
5.4	\$79,000	\$14,570	1993	17.2%	\$78,992	93	South Fayette TWP S D
5.4	\$170,000	\$31,463	1992	19.4%	.	0	Fox Chapel AREA S D
5.4	\$675,000	\$125,047	1992	22.2%	\$674,944	92	Quaker Valley S D
5.4	\$325,000	\$60,484	1994	8.1%	.	0	Fox Chapel AREA S D
5.4	\$260,000	\$48,238	1991	71.2%	.	0	Quaker Valley S D
5.3	\$250,000	\$47,004	1991	82.0%	.	0	Quaker Valley S D
5.3	\$1,087,500	\$204,667	1993	22.1%	\$1,087,488	93	Quaker Valley S D
5.3	\$867,500	\$163,331	1992	22.5%	.	0	Quaker Valley S D
5.3	\$192,000	\$36,230	1990	21.1%	\$192,000	90	Fox Chapel AREA S D
5.3	\$540,000	\$102,307	1993	25.0%	\$539,904	93	Quaker Valley S D
5.2	\$230,000	\$44,047	1994	22.2%	.	0	Quaker Valley S D
5.2	\$41,000	\$7,894	1991	39.0%	\$41,000	91	Quaker Valley S D
5.2	\$740,000	\$143,066	1991	22.9%	\$102,992	84	Fox Chapel AREA S D
5.2	\$646,000	\$125,017	1994	20.1%	.	0	Quaker Valley S D
5.2	\$938,319	\$181,976	1990	25.6%	.	0	Quaker Valley S D
5.1	\$456,000	\$89,417	1993	24.1%	\$456,000	93	Quaker Valley S D
5.1	\$90,000	\$17,714	1994	25.4%	.	0	Fox Chapel AREA S D
5.1	\$998,000	\$196,546	1990	19.0%	.	0	Fox Chapel AREA S D
5.1	\$427,500	\$84,204	1993	23.4%	\$427,456	93	Quaker Valley S D
5.0	\$475,000	\$94,435	1990	25.3%	\$474,944	90	Quaker Valley S D
5.0	\$650,000	\$129,415	1991	22.3%	.	0	Quaker Valley S D
5.0	\$150,000	\$29,926	1992	25.3%	\$149,984	92	Quaker Valley S D
5.0	\$605,000	\$120,774	1992	19.5%	\$604,928	92	Quaker Valley S D
5.0	\$405,000	\$80,920	1993	25.0%	\$404,992	93	Quaker Valley S D

6 Data Capture Technologies

6.1 Traditional Methods of Data Capture

Once a set of desired physical characteristics about residential properties is identified, there are several ways that they can be obtained, corrected, and maintained in a computer database. Before the advent of computerized databases, individual assessors typically collected and maintained the information on paper property record cards kept in file cabinets. This was the practice in Allegheny County until the early 1980's when the CAMA system was implemented, and remains the practice of individual field assessors who do not have dial-up access to the County's computer systems.

While public collection of characteristics data is probably the most common method of acquiring data, there are two other major techniques which can be pursued, either separately or in tandem.

First, there exists a large, for-profit real estate appraisal industry whose largest firms will collect, computerize, and, based on statistical models, propose assessments to the taxing jurisdiction. The computerized data, software to use the database, and even some modeling capabilities are "turn-key systems" which can be bought for \$25/parcel (or more) or about \$10.8 million for the residential properties in the County. Last year, PARR was approached by Cole, Layer and Trumbull to buy such a system which included video tapes of all property. That system, according to PARR, was offered at a price of \$40/parcel or a total cost of about \$17.2 million. These figures generally do not include computer hardware costs.

Second, property owners can be asked directly to fill out a characteristics form, with the understanding that some percentage will be randomly checked by assessors in order to achieve high response rates as well as accurate data. Here the costs are much lower (essentially printing and mailing) but data entry, correction, software for manipulation, and statistical modeling to achieve proposed assessments remain additional costs. Some jurisdictions mail out characteristics data to all property owners at the time of reassessment, and ask owners to correct or appeal them in face to face regional meetings with assessors. This is the practice in Cuyahoga County (Cleveland), and evidently works quite well. Other jurisdictions use the event of a sale to collect and verify characteristics information; this approach works particularly well for new construction, since entry is less of a problem.

The creation of a reliable database of internal and external characteristics is time-consuming; it can easily take several years in the first instance of going from manual to computerized records. Since a complete and accurate database can be used in conjunction with current sales data to perform assessments over a period of time, it is wise to view such an expensive undertaking as a capital investment that yields benefits over a number of years. Once in place, an accurate database, coupled with a system of data maintenance that utilizes building and demolition permits, can be far less expensive to run, and more accurate than a manual system.

6.2 Uses of Computerized Scanning Technologies for Data Capture and Assessment Purposes

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In the last several years, advances in computerized scanning techniques have reduced or eliminated the need to manually key data from paper forms onto computers. Most familiar are scanning wands in conjunction with standardized labels attached to items in grocery and department stores. This technology has been used by retailers for a number of years to eliminate manual entry at cash registers and also materially improve inventory management. Faster, less expensive, and more informative transaction information has resulted from the application of these technologies.

Related scanning technologies are being experimented with for various tax administration purposes. These technologies involve two steps:

1. Capturing an image of a tax document and storing it on a computer in digital form;
2. Applying pattern recognition software to the image or parts of the image in specified areas, and making intelligent use of the image so it can be interpreted as data and manipulated. This "intelligent use" of the captured image thus turns an image of a completed income tax return into actual data that can be checked for internal consistency and stored for subsequent use.

In the area of property tax administration, current scanning technology can be used, as noted earlier, to implement a construction permit system at minimum cost, or, were the survey approach used to collect property characteristics data, the resultant survey forms could be scanned and interpreted without having to manually enter the data.

Whenever this scanning technology is used with administrative forms, accuracy can be dramatically increased by redesigning the forms to maximize the effectiveness of the pattern recognition software. Putting boxes around areas to be filled in, providing small squares within which each number is to be entered, etc. can dramatically improve the efficiency of the pattern recognition software.

Just as current scanning technology can capture, computerize and interpret what is represented on a paper form, it can also be used to capture and interpret information directly from visual images of the property itself. A video tape of a property taken from various positions can be turned into a single or several images of the property which can be stored for subsequent use by assessors as well as taxpayers. As the video image is created, distance information can be obtained through the use of laser range-finders and automatically associated with the video images. Also, through the use of satellite positioning systems which are now extremely accurate, longitude and latitude of the imaged property can be associated at the time the video tape (or digital image) is captured.

²³This section is based on extensive discussions with Dr. Robert Thibadeau, Senior Research Scientist at CMU's Robotics Institute and Director of Carnegie-Mellon's Vision and Imaging Laboratory

When this distance information is matched to the images of a building, inferences about the dimensions of the building (its frontal length, and width), number of floors, style, and ultimately living area can be made.

6.3 Geographic Information Systems Footprints

In April 1992, and March 1993, Air Photographics, Inc. of Martinsburg West, Virginia flew over Allegheny County and took aerial photographs. The position of sensors at known longitude and latitude locations and their recognition by the aerial photographic process allow such aerial photographs to be turned into digital maps with known longitude and latitude. The fly-overs, through a contract between Michael Baker Engineering and Allegheny County, was the beginning of a long-term project in Allegheny County to develop a Geographic Information System.

To make these aerial photographs useful for tax, sewer and water planning, bus routing, road maintenance, congestion planning, and emergency or 911 planning, they must be linked to existing paper maps. In the case of property tax administration, this requires that the property tax maps, which the County maintains, be scanned or imaged, and the images placed on top of computerized images from the aerial photographs. Once the two images are aligned on top of each other, the exact longitude and latitude of each parcel on the tax maps can be inferred from the longitude and latitude from the digitized map from the aerial photograph. In turn, the dimensions of the land can be precisely calculated.

Any building photographed through aerial photography creates a shadow that is distinct on the photograph, and can be recognized by appropriate software applied to the digitized photograph. In the process of matching the tax map and the aerial map, one can also calculate the area of the building's shadow or "footprint." Care must be taken in making inferences about living area from such shadows or "footprints" since a parcel of land may have multiple structures (for example, a separate garage) only one of which may be a main dwelling. Also, a single structure may have an integral garage whose shadow will overstate actual living area. Any shadow typically also contains a roof overhang that will further exaggerate the extent of living area. Row houses create other kinds of inference problems. Nonetheless, in the absence of any other reliable information, building shadows or "footprints" when matched to other administrative property records can materially assist the collection of land and basic building area data. Currently, Allegheny County in conjunction with Duquesne Light have a contract with the Centec Corporation of Arlington, Virginia to scan paper tax maps, and match the resulting digitized images to the digital maps obtained from the fly-over.²⁴

6.4 Aspects of the 1995 PARR Laptop Data Collection Effort

²⁴It was hoped in February, 1995, that by late March, 1995 some footprint data on properties in Pittsburgh could be made available to this project. However, neither the GIS Group in the City of Pittsburgh nor the GIS Group in Allegheny County was able to provide building shadow areas information by lot and block numbers.

During the summer of 1995, PARR undertook a pilot project of equipping their assessors with laptop computers to collect residential property characteristics data in Swissvale, Franklin Park, and Robinson Township. Initially stored on the laptops was the street address and lot and block number of each residential property. A series of data entry windows were created with a database program, and County assessors drove down streets and entered information about external characteristics of the land parcel and structure.

These 1995 data were then uploaded to the County's mainframe, and provided to this research project. Overall, 13,253 data from the two sources were exactly matched by lot and block. Table 17 and Table 18 show the results of matching each of the properties, examined with the laptop data entry process, by lot and block to the historical CAMA data on the same properties.

Table 17 compares the building style characteristics captured by the laptop data collection effort to the historical characteristic data in the CAMA file. Unfortunately, the classification system used this summer is somewhat different than that used by CAMA, however, there is enough similarity that we can ascertain if two separate data collectors, looking at the same property (the same lot and block number), determined the same thing. First, note that the building styles captured by the laptop effort are the *rows, A) through P)* of Table 17, while the building styles captured by the CAMA data collection process are the *columns, (2)-(10)* of Table 17. First, note that the laptop effort was not able to ascertain the building style of 4,285 properties (see Column (10), row A), while the CAMA data base is missing building styles on 4,052 residential properties (see Column (2), row P)). Thus, both collection efforts were unable to classify the building styles of about 30% of the residential property in the three municipalities.²⁵

The CAMA data classified 2,258 properties as "Ranch" style homes, (see Column (3), row P), while the laptop data collection effort classified 1,720 properties as "Ranch" style homes. Only 1,496 properties were classified as "Ranch" by both data collection efforts. Of the 2,258 Ranch style houses, as classified by the CAMA data source, 111 were classified as 1.5 story properties in the laptop data collection effort. Of the 1,720 Ranch style properties, as classified by the laptop data collection effort, 58 were classified as 1.5 story houses by the CAMA data, and another 23 as 2 story.

If we examine how 2 story houses were classified, we find that both sources observed, 2,838 2 story houses, but that the CAMA data classified many (239) properties as either Ranch, 1.5 stories, 2.5 stories, 3 stories, or some other style houses.

²⁵The rate of missing data did not vary by municipality.

Table 17: Comparison of Housing Style Data: 1995 Laptop vs. CAMA for Franklin Park, Robinson Twp, and Swissvale

Laptop Data	CAMA									(11) Total
	(2) Missing	(3) Ranch	(4) 1.5 Story	(5) 2 Story	(6) 2.5 Story	(7) 3 Story	(8) Split Le	(9) Rais. Ranch	(10) Non Mobile	
A) Missing Data	2,796	421	220	657	81	8	22	12	68	4,285
B) Ranch	90	1,496	58	33	0	0	23	16	4	1,720
C) Two Story	684	85	156	2,838	135	4	4	11	29	3,946
D) Story and Half	61	111	400	95	5	0	8	3	3	686
E) Split Entry	14	88	8	24	0	0	61	116	2	313
F) Split Level	9	39	7	17	0	0	75	13	1	161
G) Two and One Half	59	2	18	385	474	15	1	0	0	954
H) One and Two Story	36	9	17	186	2	1	10	1	28	290
I) One and 3/4 House	3	2	15	22	3	0	0	0	0	46
J) Mid Row Townhouse	40	1	2	127	2	0	0	0	0	172
K) End Row Townhouse	36	1	1	131	7	1	0	0	0	177
L) 1/2 of Double	116	1	3	92	5	0	0	0	2	219
M) Double	27	2	2	55	5	1	0	0	0	92
N) Duplex	14	0	2	65	8	0	0	0	1	90
O) Other	67	0	0	20	2	13	0	0	0	102
P) Total	4,052	2,258	909	4,747	729	43	204	172	139	13,253

Table 18 shows the results of comparing the two data sources characterization of exterior finish. Note that both efforts failed to collect exterior information on better than 4,000 of the 13,253 properties across the three municipalities; about 30% have missing exterior data.

Again, unfortunately, the classification systems used by the older CAMA system and the 1995 laptop data collection effort are somewhat different; however, there are several similar categories. If we examine the "Stucco" classification, which is common to both, we find that the laptop data collection effort classified 73 properties as having Stucco exterior finishes, while the CAMA classified only 42 properties as having Stucco exterior finishes. Moreover, they only jointly agreed on 21 properties as having Stucco finish. The laptop data collection effort classified 6,065 properties as having a "Brick" finish, while the CAMA database assigns "Brick" to only 4,361. However, another 1,503 are "Asbestos and Brick," and another 1,391 are either "Wood and Brick" or Aluminum and Brick."

In terms of both types of characteristics data, the very high missing data rates, on the order of 30%, and the differences in style and exterior finish characterizations of the same properties, indicate the difficulties in obtaining complete and accurate data on residential properties.

Table 18: Comparison of Exterior Data: Laptop vs. CAMA for Franklin Park, Robinson Twp, and Swissvale

Cama	Laptop						Total
	(2) Missing Data	(3) Brick	(4) Siding	(5) Stone	(6) Stucco	(7) Wood	
A) Missing Data	2,806	726	481	12	10	51	4,086
B) Brick	691	3,553	86	18	3	10	4,361
C) Aluminum and Brick	182	836	466	5	5	9	1,503
D) Aluminum and Stone	15	9	22	17	4	0	67
E) Aluminum or Vinyl	183	34	578	6	2	28	831
F) Asbestos	46	8	76	1	0	2	133
G) Brick and Stone	4	40	0	6	0	0	50
H) Inselbrick	39	29	94	2	0	1	165
I) Stucco	4	9	6	1	21	1	42
J) Stone	24	16	12	37	3	2	94
K) Wood and Brick	81	555	135	5	2	29	807
L) Wood and Stone	14	16	28	9	0	10	77
M) Wood Siding (Frame)	128	51	328	2	8	78	595
N) Wood Shake (Shingle)	11	0	25	0	0	3	39
O) Other	73	183	92	27	15	13	403
P) Total	4,301	6,065	2,429	148	73	237	13,253

7 Conclusions

7.1 Major Findings with Regard to the Sources and Quality of Data

This first report on the ways to improve the assessment of residential property in Allegheny County concentrated on the quality of data available on such properties because complete and reliable sales and characteristics data are central to the application of modern appraisal techniques. With complete and accurate data in a computer database, arms-length sales prices of properties can be used to make inferences about what similar properties, that did not sell, are worth.

In the 1990's in Allegheny County, on the order of 20,000 to 25,000 residential properties were sold or 4.4% to 5.9% per year of the total number of taxable residential properties. However, many of these sales were not arms-lengths sales as they were sales within a family. In principle, even 10,000 to 15,000 bonafide sales/year represents a sufficient number with which to statistically model the residential real estate market. In a subsequent report, I will indicate the results of using different types of statistical models to assist the assessment of properties which do not sell.

The professional assessment literature points to the importance of collecting locational information and physical information about each house and land as a first step to building reliable models that can predict the value of residential properties. Typically, information on the internal and external characteristics of each house, and the nature of the land on which it resides are collected and maintained to assist the assessment process. The major purpose of this report, given the central relationship between knowing these characteristics and predicting the sales prices of house, has been to ascertain the completeness and accuracy of such data as maintained by Allegheny County's Property Assessment, Appeals, and Review Board.

This review has found the following:

1. *Data on Residential Land.*--while each residential property in Allegheny County's computerized assessment database has associated with it a measured land area, a comparison what these areas add up to by school district, to that reported by the U.S. Census Bureau, indicates that the County's computerized land records used for assessment purposes add up to 122% of what Census reports: compare 892.7 square miles to the Census figure of 727.9 square miles.
2. *Data on Age Distribution of Residential Properties.*-- Unlike the County's land area data, its information on the year each residential property was built is incomplete: only 80.2% of the residential properties on the County's computerized assessment database have an entry for the year of original construction. Comparison of the age distribution of these properties to the age distribution of the housing stock reported in the 1990 Census shows many gaps in time periods, and a different age distribution.

An examination of the counts of number of bedrooms in the County's computerized database of residential properties shows that only 71.8% of the residential properties

have information on the number of bedrooms. However, there is some similarity in the pattern of bedroom distributions to that found in the 1990 Census.

3. *Completeness of Information on New Construction.*—while municipalities voluntarily report to the Census Bureau the new construction permits for single and multiple family homes, they do not routinely report this to Property Assessment, Appeal and Review, because there is not system in place in the County to collect that information. A comparison of federally published building permits in 1993 and new houses sold in 1993 and 1994 in the County's computerized database show significant differences, even allowing for the passage of time between issuance of a permit and construction and sale of a property.
4. *Overall Completeness of Information on the Living Area of Residential Properties.*—only 1.7% of the residential properties in Allegheny County's computerized database of residential properties have any information on the number of square feet of living area, a prime determinant of value in the market place.
5. *Overall Completeness of Information on Inside Characteristics of Residential Properties.*—only 67.1% of the residential properties in Allegheny County's computerized database have information on the type of basement, number of bathrooms, kitchen, and bedrooms in each residential property.
6. *Overall Completeness of Information on External Characteristics of Residential Properties.*—only 83.4% of the residential properties in Allegheny County's computerized database have information on the exterior, neighborhood, topography of land and nature of surrounding property.
7. *Geographic Pattern of Missing Data.*—there is very clear, systematic evidence that the County has less information about residential properties in more affluent areas. In the County's computerized database, only 32% of the residential properties in Upper St. Clair contain inside characteristics data, while 67% of the residential properties in Duquesne contain inside characteristics.

Under Pennsylvania assessment law, the owner is under no obligation to allow an assessor inside a property to assist the assessment of the property. An assessor may only go inside if invited. This is not true in other states, and explains at least in part why Allegheny County's data on residential property is incomplete. ²⁶

8. *Accuracy of Sales Prices* A review of a sample of transactions records from the Allegheny Recorder of Deeds and sales prices maintained in the County's computerized assessment database indicates an accurate relationship between the sales price used for the administration of the state Realty Transfer Tax and that used for assessment purposes.

²⁶In a subsequent report, the laws governing assessment in other states will be reviewed along with measures of the quality of residential property assessments, as well as the related issues of privacy which right of entry may raise.

However, an inspection of the sales of large residential properties (5-75 acres) in 1990-1994 raises questions about the underlying accuracy of the prices used for Realty Transfer purposes. Some very large properties sold for very modest amounts. Whether this reflects inaccuracies in the underlying land measure, very poor quality land and houses, or complex tax planning by buyers and sellers, however, could not be ascertained.

9. *Recent Difficulties in Data Collection.*—a comparison of characteristics data collected this past summer by County assessors in three municipalities to historical characteristics data, collected in the early 1980's, indicates that obtaining characteristics on 30% of the residential properties has not been possible. Moreover, where characteristics data was collected this summer, it did not always correspond to that historically collected. While it is simply not possible to determine which data collection effort was more accurate, there are troubling differences in what two data collection efforts saw when looking at the same properties.

7.2 Implications for Further Research on Ways to Improve the Assessment of Residential Properties in Allegheny County

It had been hoped when this project was initiated in 1994 that there would be information on the living area of each or most residential properties in the County to assist in the statistical modeling component of the project. Because so little is available, and there is a systematic, inverse, relationship between the affluence of communities and what the County knows about the residential property in each area, further research is warranted to ascertain ^{how} data on residential properties may be reliably and inexpensively collected. Accordingly, the next report will examine in detail the issues of right of entry to properties in the assessment process and other measures other states use to ensure that local assessors can collect complete and accurate data on residential properties.

Also, given the variability in prices, the next report will also examine how arms-length prices are defined, and way that state governments assist the local assessment process.

The variability in observed assessment ratios in this report suggests that it be carefully examined further, along with issues of resources and organization of the assessment process in Allegheny County compared to other jurisdictions. Cuyahoga County, Ohio is quite similar to Allegheny County in many respects and will be the subject of a comparative analysis.

Finally, prior to developing the strategic plan for improving the assessment of residential property, which is the final outcome of this series of research projects, what data is available will be used to statistically model the residential real estate market in Allegheny County.

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