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The structure and distribution of Iowa non-corporate real property assessments

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THE STRUCTURE AND DISTRIBUTION OF

IOWA NON-CORPORATE REAL PROPERTY ASSESSMENTS

by

James Jay Mikesell

A Thesis Submitted to the

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INTRODUCTION

A History of the Real Property Tax in Iowa

Taxation of wealth through the property tax has existed in the United States since the Colonial period. Property tax began as specific taxes on such items as carriages and land. Later, the property tax became a more general levy encompassing real property and personal property, both tangible and intangible.

Property taxation in Iowa dates from 1838 when the Territory of Iowa was separated from the Territory of Wisconsin (23, p. 47). A decentralized taxation system, designed principally to meet local financial needs was established by the first Legislative Assembly of the federally financed Territory of Iowa. When Iowa became a state, in 1846, the state government required internal financing and the general property tax was turned to for this revenue. However, over the years the property tax lost its role as chief provider of state revenue. The general property tax, as a percentage of all state taxes fell from 51.2 percent in 1902 to 1.8 percent in 1950 (18, p. 40). The only state imposed property tax at present, is a small special levy (less than one percent of total state revenues) to pay off soldiers' bonus bonds. The general property tax provides about fifty percent of the total local revenues and is followed in importance by

state and federal aid which provides about thirty percent
of local revenues over the entire United States (17, p. 9).
In Iowa property taxes provide a slightly larger percentage
of local revenues, with the 1962 figure slightly over
sixty percent (10, pp. 4-5). The property tax is the only
readily adjustable local revenue tool, with these adjustments
made through millage rate changes.

With the establishment of the Iowa State Board of
Assessment and Review (later called the State Tax Commission)
by the Forty-third General Assembly in 1929, came the first
major change in the Iowa property tax structure since 1846.
However, since 1929, the State Tax Commission has undergone
numerous changes, which have at times increased and other
times decreased its power. In terms of function, the
State Tax Commission has lent an element of central control
to a formerly decentralized system.

Until 1947, except for a few short intervals first as a
territory and then as a state, Iowa property was assessed
according to the desires of the local governments on a
township, city, town, or county basis. The result was a
large number of assessing officials and of assessing
districts, with overlapping jurisdictions and making
consistency in assessments difficult if not impossible.
Legislation in 1947 eliminated all assessing areas except
the county, and city districts for cities of over 10,000
population, at the city's option (9, p. I).

This brief summary of the history of Iowa property taxes shows many changes to have occured in the development of the Iowa property tax system. Consequently, changes in the property tax system should be viewed as consistent with the dynamic nature of the tax system, not as in opposition to a rigid system.

The Present Iowa Assessment System

Overseeing Iowa property assessments, and fulfilling a number of administrative functions, is the Property Tax Division of the Iowa Tax Commission. The Property Tax Division assesses all public utilities and railroads. After assessing these properties it apportions the valuation to which the local levies are applied among the appropriate local taxing units.

In connection with its duty as quasi-head of all state assessments, the Property Tax Division collects assessments and sales prices for all Iowa properties sold in a given year. The summary of this study, conducted under the provisions of subsection 6, section 421.17, Code of Iowa, is published yearly as the Summary of Real Estate Assessment Ratio Study. This study, to be dealt with in later parts of this report, will be referred to as REARS.

The Iowa Tax Commission has the power to require the reassessment of any property in the state. Such a

reassessment may require the adjustment of all assessed values of a certain property type in a given tax area, or only the reassessment of one or a few individual properties. REARS is used by the Iowa Tax Commission to locate cases of general assessment inequalities.

According to Iowa statutes, beginning in 1933 all real property is to be assessed every four years and taxed every year (8, p. 80). All personal property is to be assessed and taxed every year. According to Iowa law all property subject to the general property tax is to be valued at its actual value and assessed at sixty percent thereof (9, p. II).

In summarizing a number of court interpretations of what the actual value is David T. Scott says, "In arriving at this figure (the actual value) the assessor is to consider the productive and earning capacity of the property, past present, or future, plus the market value, if any, of the property, and all other matters that might affect the actual value" (23, p. 21). This description seems to be of little use as it states what actual value does not mean, but not what it does mean.

One of the basic ingredients for perfecting an assessing system is a corps of competent assessors. Although the "perfect" system is definitely a subject of conjecture we find the Iowa system to be superior to that existing in many states(4, p. 69). The county assessors or city assessors in cities of over 10,000 population face

first a qualification test, administered by the Iowa Tax
Commission, to determine their ability to perform the
duties of assessor. Only those passing this examination
are eligible to be considered for appointment by a board
composed of representatives of all the affected assessment
districts. The appointee serves a six-year term as the
full-time supervisor of all assessing within the county or
city.

Court Interpretation of the Iowa Statutes

There has been no court decision upholding the
statutory requirement that all property be assessed at
sixty percent of actual value as the correct guideline to
fix assessment ratios. The guideline followed by the
courts is equal assessment ratios between and within county
and property type strata. One of the principle tools used
by the courts to judge the inequality of assessment ratios
is the assessment ratio tables as reported in REARS. The
power of the Tax Commission to order local areas to
reassess certain properties or groups of properties has
been upheld by the courts on several occasions (23, p. 23).
In a 1930 case in Webster County, Judge Stevens of the Iowa
Supreme Court ruled, "The purpose for which a state board
of assessment and review was created ------- as expressed
by the legislature is that all assessments of property and
taxes levied thereon be made just and uniform in substantial

compliance with the law" (12, p. 23).

Although the duties of the State Board of Assessment and Review have undergone numerous revisions the "relatively just and uniform" index continues as the legal guideline for equitable assessment.

The Present Assessing Practices

There are no counties that assess properties at the statutory sixty percent of actual value. In 1964 the state average assessment ratio, as determined by REARS, was 24.9 percent for urban properties and 23.1 percent for rural properties (9, p. 1). The 1964 REARS study shows no assessing area as high as the sixty percent statutory requirement.[1]

The existence of a ready and large market for urban residential properties would suggest that values for these properties could easily and accurately be assessed. REARS shows a state average of 23.9 percent for residential properties which may be a more accurate measure of the ratio at which it is attempted to assess all properties. It thus appears that an adjustment of statutory requirements to correspond with accepted procedures is in order.

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[1]Slightly different values for the assessment ratios as determined by this study will be presented later.

It is useful to speculate on some measures of value for properties other than urban residential properties as how assessors establish the value of properties for which a ready market does not exist is not a matter of fact. Actually assessors probably use some combination of the measures to be suggested in the assessment procedure.

The value of agricultural or mercantile properties may be set by the sale price of nearby or similar properties. It may be related to the purchase price of the property, if recently purchased, or to gross or net income from the property. Value may include the original or replacement cost of improvements (e.g. a barn or a meat case), the depreciated value of these items, or their current sale price. The value which we wish to establish is the sale price in an unrestricted market, as this is the most strived for measure of value for assessment purposes. Stanley L. McMichael, quoting the Supreme Court of California in Sacramento R.R. Co., et al., vs. Heilbron, repeats, "Market value is the highest price, in terms of money which land will bring if exposed for sale on the open market, with a reasonable time to find a purchaser, buying with a full knowledge of all the uses and purposes to which it is adapted and for which it is capable of being used" (21, p. 23).

A problem unique to any mercantile property which does not represent a business engaged in a perfectly

competitive market (which is nearly all mercantile properties) is the value of an established trade. Established trade denotes any real or imagined product difference or the existence of a captive market. Such a value could be included in the sale price of a property and still not be incorporated in the worth of the property, per se. A closely related problem of valuing property exists when a substantial part of the firm's business is transacted off the premises. An example might be a dairy and produce business operated from a small building but incorporating numerous trucks which pick up milk and eggs and deliver them to processors. In such a case there would again be little relation between the value of the business and the value of the real estate. Such possibly diverse measures of property value emphasize the need for a more explicit legal definition of value, particularly for mercantile properties. These possible measures also suggest a need for caution in interpreting the results of sales ratio studies for mercantile properties. If the value of the business is higher than the actual value of the physical property the sales ratio has a downward bias when used to measure the assessed value to actual value ratio.

In recent years it has become increasingly common practice to hire professional assessors from outside the assessment district. The role of the local assessor in making assessments then becomes merely to assist the

professional assessors in their work, if necessary, and to help make adjustments in assessment values when the original assessment value is protested. The local assessor then combines this role with his principle function as a bookkeeper for assessments and property taxes.

Such professional assessors have both advantages and disadvantages over local assessors. The experience of professional assessors is invaluable in viewing a physical unit and placing a consistent value on the properties. On the other hand such professionals may not be as cognizant of local differences in the value of physically identical properties while local assessors, who are familiar with these differences will take them into consideration. Whether or not such provate assessment firms are deemed desirable their existence and use is a matter of fact.

These observations, if they do nothing else, illustrate some of the complications inherent in any property tax system.

CONCEPTUAL FRAMEWORK

The Use of Assessment Ratios

Taking a quite naive look at assessment procedures, a system in which all properties within each taxing area are assessed at the same percent of actual value might be thought a "fair" system. A person holding this view would argue that changing the millage levy, or increasing all assessed values by the same percentage are equivalent methods of raising taxes as they both maintain the "fair" system. We find, however, that they are not equivalent ways of raising additional revenues and that often a low valuation and a high tax rate are advantageous to the local taxing body while sometimes the reverse is true.

The state imposed agricultural credits are administered by exempting agricultural property from general school fund levies in excess of fifteen mills (8, p. 108). Thus, a low valuation and a high tax rate are advantageous to the local taxing unit as it means a larger exemption for the farmers of the district and thus a larger state subsidy to that local area.

The borrowing power of local governments is constitutionally set as five percent of assessed valuation. Without the same fixed assessment ratio for all areas, the assessor has the power to set the local government's borrowing limit. Local governments which have borrowed up

to, or near to, their legal limit may thus desire high valuations and a low tax rate. At present the matter of linking borrowing power and assessed value has been under review because of the recent removal of moneys and credits from the tax rolls.

Low assessment ratios may make equal percentage differences in valuations appear to be quantitatively smaller than if the property were assessed at the higher sixty percent of actual value. Also, if this assessed value is below the legal assessment ratio a person may be all the less likely to appeal the assessment. The above argument postulates an illusion similar to the familiar economic concept of money illusion.

It should be noted that even without conscious attempt by local taxing areas to manipulate assessment ratios the study of assessment ratios has definite use. It is important to point out assessing areas where there are problems of valuation consistency and bias. Attaching the guideline of equal assessment ratios for all properties we can make a judgement on the "fairness" of the existing administration of real property assessments.

Equity Considerations of Assessment Ratios

Equity considerations of assessment ratios have their basis, of course, in the final reflection of these assessments in property tax incidence. Many arguments

against the property tax have been founded on its basic inequity, a conclusion which finds wide support as neither the principle of ability to pay nor that of benefits received are satisfied by today's property tax structure.[1]

Considerations of what constitutes equitability in property taxes might produce a valid basis for unequal assessment ratios. For instance, the judgment that residential properties receive a proportionally larger amount of property tax financed projects and that the benefits received principle should apply, may make the assessment of residential properties, at a higher ratio of actual value than other properties, equitable. However, if such an adjustment is desired it would be more explicit and more easily regulated through differential millage rates. Assessments then become a tool to work with in distributing the incidence of property tax and as such need to be stated with as much accuracy and consistency as possible. In other words, since explicit consideration of the equity of the assessment process accepts the existence of the general property tax framework as given, equity considerations of the general tax are not appropriate criticisms of the equitability of the assessment procedure.

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[1]In the past holdings of property may have been a better indication of ability to pay and thus the property tax more nearly fulfilled one possible criteria of equity.

Any deviations in the assessment ratios thus warp the
target incidence of the property tax.[1]

Objectives

Implications to the Real Estate Assessment Ratio Study (REARS)

As stated earlier the Property Tax Division of the
Iowa State Tax Commission, persuant to the Code of Iowa,
1962, compiles each year, from July 1 through June 30, a
set of real estate assessment ratios. This Real Estate
Assessment Ratio Study, or REARS, is based on a sample of
properties sold on contract, or warrenty deed in bonifide
sales as reflected by the actual price paid on the open
market, or the consideration shown, by or between a willing
buyer and a willing seller (9, p. II).

One objective of this study is a critical evaluation of
REAR's use of a sales sample to determine existing assessment
ratios and the resulting implications of this approach.
Specific causes of bias to be considered are county size and
property type where comparisons over sample counties may be
extrapolated to the entire state. It is hoped that this
analysis will help set guide lines within which REARS is a
useful decision tool and outside of which it should be used
with caution, if at all. The use of REARS, by the Iowa

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[1]Shifting effects complicate the incidence pattern
greatly but a lack of adequate information on shifting
makes its meaningful inclusion impossible (27, pp. 32-66).

State Tax Commission, as a basis for ordering adjustments of assessment ratios within certain counties and property types, makes such an evaluation of the strengths and weaknesses of REARS quite important.

Conclusions of the random sample study

The second objective of this subjective study, (referred to as SUB) is twofold. First, through tables giving assessment ratios by county size and property class, the existing assessment ratio picture will be shown. Next the actual differences in assessment ratios by property type and county size will be evaluated in an attempt to isolate their causes. We will look at the variance of assessment ratios within county size groups and property types. These measurements will reflect on the consistency of assessment ratios within county size groups, thus showing whether large assessing networks are more or less consistent in assessment practices than the small ones. Comparing the variance among property types will give us an idea of the difficulty of consistent assessment practices by property type. Of course, these conclusions of the SUB study are the tools for the analysis of REARS and thus these two objectives of SUB are intimately related.

The results of SUB may be useful in suggesting more useful measures of assessment ratios, easier methods of arriving at equivalent measures, or more meaningful

interpretations of the results of past or future studies.

In conclusion it can be said that the twofold purposes of this work are (1) to provide insights for the present method of determining assessment ratios, and (2) to present an interpretation and partial analysis of the Iowa real property assessing system as it existed in 1964, with these two objectives closely intertwined.

DESCRIPTION OF THE SAMPLE

Sampling Procedure

The data used in SUB is taken from a general property tax survey financed by the Agricultural Extention Service, Iowa State University. The sampling procedure, interview process, and recording of data were handled by the Statistics Department with the close cooperation of the Economics Department at Iowa State University.

Although the total study sampled all forms of taxable noncorporate property the SUB study uses only the subsample of real properties. Personal property is excluded because of the impossible task of giving it an accurate market value. The sample was stratified to ensure that it would be statistically large enough for larger counties and for mercantile properties which are both relatively small segments of the total group of real properties. The counties were selected systematically within each of the three size classes, within a serpentine format. The size of the largest counties sample is seven while the other two county size groups contain samples of eight counties each. Table 1 lists the population and sample elements by strata, while Figure 1 shows their spatial distribution.

The questionnaire for the general survey contained questions on public policy relating to the property tax, household composition, family net worth, family income,

Table 1. County group designations for the SUB study.

Group 1 (large counties)

*Woodbury	*Pottawattamie	*Polk	*Black Hawk
*Linn	*Dubuque	*Scott	

Group 2 (medium counties)

*Cerro Gordo	*Cherokee	*Marshall	*Dallas
*Clinton	*Warren	*Jefferson	*Appanoose
Fayette	Floyd	Emmet	Clay
Plymouth	Buena Vista	Webster	Hamilton
Story	Boone	Carrol	Jasper
Powesheik	Johnson	Muscatine	Mahaska
Marion	Cass	Union	Wapello
Henry	Des Moines	Lee	Page

Group 3 (small counties)

*Allamakee	*Dickinson	*Humbolt	*Buchanan
*Crawford	*Guthrie	*Washington	*Freemont
Winneshiek	Howard	Mitchell	Worth
Winnebago	Hancock	Kossuth	Osceola
Lyon	Sioux	O'Brien	Palo Alto
Pocahontas	Wright	Franklin	Butler
Chickasaw	Bremer	Clayton	Delaware
Grundy	Hardin	Calhoun	Sac
Ida	Monroe	Greene	Tama
Benton	Jones	Jackson	Cedar
Iowa	Audubon	Shelby	Harrison
Adair	Madison	Keokuk	Louisa
Monroe	Lucas	Clarke	Adams
Montgomery	Mills	Taylor	Ringgold
Decatur	Wayne	Davis	Van Buren

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*Designates the counties sampled in the SUB survey.

LYON OSCEOLA DICKINSON 14 EMMET KOSSUTH WINNEBAGO WORTH MITCHELL HOWARD WINNESHIEK ALLAMAKEE

SIOUX O'BRIEN CLAY PALO ALTO HANCOCK CERRO GORDO 22 FLOYD CHICKASAW 11

FAYETTE CLAYTON

PLYMOUTH CHEROKEE 23 BUENA VISTA POCAHONTAS HUMBOLDT 17 WRIGHT FRANKLIN BUTLER BREMER

WEBSTER BLACK HAWK 31 BUCHANAN 12 DELAWARE DUBUQUE 32

WOODBURY 37 IDA SAC CALHOUN HAMILTON HARDIN GRUNDY

MONONA CRAWFORD 13 CARROLL GREENE BOONE STORY MARSHALL 27 TAMA BENTON LINN 33 JONES JACKSON

CEDAR CLINTON 24

HARRISON SHELBY AUDUBON GUTHRIE 16 DALLAS 25 POLK 34 JASPER POWESHIEK IOWA JOHNSON

MUSCATINE SCOTT 36

POTTAWATTAMIE 35 CASS ADAIR MADISON WARREN 28 MARION MAHASKA KEOKUR WASHINGTON 18 LOUISA

MILLS MONTGOMERY ADAMS UNION CLARKE LUCAS MONROE WAPELLO JEFFERSON 26 HENRY DES MOINES

FREMONT 15 PAGE TAYLOR RINGGOLD DECATUR WAYNE APPANOOSE 21 DAVIS VAN BUREN LEE

LEGEND

SMALL ⊘   MEDIUM ⊗   LARGE ⊙

Figure 1. Location of counties in the SUB sample, by size group.

and shifting of the property tax, as well as values and
types of taxable properties held. All questionnaires were
completed by personal interview with the property owner or,
if the owner was not able or willing to answer, with some
other person intimately acquainted with the properties and
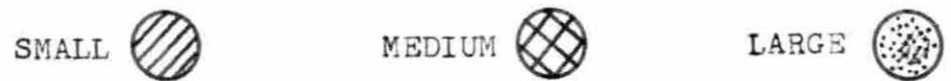the household in question. In some cases interviewers
obtained information from more than one respondent. The
interviewers obtained information on assessed value,
millage rate, exemptions, and taxes from public records on
file in the court houses.

Each county size group is sampled at a different rate,
which means that the data had to be weighted before adding
over size groups. The same weighting procedure became
necessary when adding the figures for different property
types within counties as each property type is sampled at
a different rate. The three real property types
individually sampled are residential, agricultural, and
mercantile. Since the study was designed to show the effect
of Iowa property taxes on Iowans, the sample contains only
properties owned by Iowa residents. Any properties owned
entirely by nonIowans were excluded completely from the
sample and no interview was taken. It is necessary,
therefore, to assume that the group of all properties
owned by nonIowans has the same chacteristics as the group
of all properties owned by Iowans.

A decreasing dominance order of mercantile, agricultural,

and residential properties was established for use in cases where the same household unit held more than one of the three types of property. Thus, if an individual owned both mercantile and residential property he would be allowed only one chance to enter the sample. This chance would be at the rate at which mercantile properties were sampled in his home county (i.e. his county of residence).

People who owned property in several counties are treated as residents of the county in which they had residential personal property assessed in 1964. This is necessary so that these property owners do not have multiple chances to enter the sample. For example, an agricultural real property is assessed to Mr. Black in County A but Mr. Black lives in County B. If Mr. Black rents the farm in County A to Mr. Brown, neither Mr. Brown nor Mr. Black enter the study through this property, even if County B is one of the 23 sampled counties. However, Mr. Brown can enter the sample through his own property in County A, or Mr. Black can enter the sample through property in County B.

Many sampling problems occurred during the selection of the sample because of the numerous methods of filing (and misfiling) encountered in the various counties. The two most common filing methods were 1) parcel filing, where all properties owned by each tax payer were filed together and 2) the property file, where each property was

filed according to its location and each personal property was filed spearately, in alphabetical order. Other filing schemes included 3) quasi-alphabetical filing, where all A's, B's, etc. were filed randomly or semirandomly in individual letter files, and 4) partial parcel, where a file was kept of unpaid receipts and paid receipts were kept in little or no systematic order. The parcel filing method was the easiest from which to draw a random sample. Other methods, including incomplete parcel filing, necessitated adjustments by eliminating final schedules before processing of the data. Both of these adjustments required the throwing out of some interviews and thus some information loss was suffered. It appears that the various filing methods used for property taxes might be an impediment to accurate checks of accounting procedures, particularly during periods when taxes are most commonly paid. Standardization of filing techniques might be a fruitful area for state legislation or regulations from the State Tax Commission.

Another variable among counties was the property type classification with intra-county, inter-district, and intra-district property classification inconsistencies. The actual frequency of such cases was quite small (about 2%) and necessary adjustments were made where an obvious misclassification existed. It should be noted here, though, that a sales ratio study does not have the possibility of reclassification which this personal contact survey had.

The unit being studied in this survey is the family, or more accurately the household. Thus, if a property owned by one household member entered the sample this also brought in all other Iowa properties owned by other members of the household.[1] Such household members may, but need not, be relatives of the household head. An attempt was made to be consistent with the definition of household member as used by the Bureau of the Census.

SUB is a subset of the larger sample where real properties within each of the 23 sample counties are the sampling unit, rather than the household. For this reason properties included in the larger study and located in one of the 76 nonsample counties, but not owned by residents of one of the 23 sample counties, are not included in the SUB study. The incidence design of the total study also eliminates from the SUB sample any properties in the 23 sample counties which are owned by residents of the 76 nonsample counties. The SUB sample is then characterized as a stratified systematic sample of all noncorporate properties in the 23 sample counties which are owned by residents of the sample counties.

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[1]Such additions of properties necessitated a post interview adjustment of sampling rates.

Coding, Definitions, and Adjustments

Since the SUB study makes use of only a portion of the information obtained in the larger survey, and this information is contained in several different places in the interview schedule, it was necessary to draw information from several different places on the interview schedule to completely define an economic unit for the SUB study.

Because of the sampling procedure previously explained, properties entered the sample at different sampling rates which are not directly linked to any characteristics of the property, such as function or location. Information on the sampling rate at which a particular schedule (household), and thus all the properties brought in by this schedule, entered the sample was contained on the first card.

The most important section is that containing information about the economic unit. This card determines what, in the eyes of the property owner constitutes the economic (functional) unit of property. In the case of a farm this may be the pieces of land that are farmed together, or for a residential property, all the lots that constitute one home and adjoining land. Often one economic unit may be several assessed units of property which may or may not be adjacent. To give an accurate view of the value of a property it is assumed that the entire functional unit, and not some subsection of it, is the correct unit to analyze.

The property owner was asked to specify the function

of his property and its market value on the basis of the economic unit which he had just defined. Knowing the function and the value of the economic unit is not sufficient for SUB as the assessed value for each economic unit must also be specified. This information was collected, for each assessed property in the sample, from the tax records in the county assessor's office. Since these assessed properties do not necessarily have a one-to-one correspondence to the economic units the assessed value was sumed over all properties in the economic unit. This emphasis on economic units rather than individual assessed properties gives SUB another advantage over REARS as the value of the total economic unit may differ from the combined values of the unit's individual parts.

Classification into one of the three groups, mercantile, agricultural, or residential, was difficult for a small proportion of the total sample of properties. Among the problems were properties which served a multiple use, those which were apparently mislabeled when assessed, and multiple dwelling units. Multiple dwelling units which housed more than two household units in addition to the owner, living on the premises, were classified as commercial properties. When the property type assigned by the assessor appeared obviously incorrect to the interviewer and contradicted the function assigned by the property owner the

property owner's definition was used. If a property served a multiple use, of which one use was greater than any of the others the property was classified as the predominent type.[1]

Changes in classification were made by a combination of observations of the interviewer and comments by the property owner. The occurrence of such mislabeling was quite rare, occurring in less than one percent of the sample properties.

There were several instances of a retail store which was also the dwelling unit for the store operator. Such cases were given a special classification in the overall survey but, because of their small number, are treated as mercantile properties in SUB. Justification of this classification can be found in the parellel situation of the farmer who lives on his farm and has his home and all household property assessed as agricultural.

Composition of the SUB Assessment Ratio Estimator

All Iowa counties are divided into three groups according to the population of their largest town. The largest seven counties compose the first group, the 32 next smaller counties the second group, and the 60 remaining counties the third group. All counties from the first strata

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[1]In one instance a painter, who kept a ladder and a few other painting supplies in his garage, had his home and all his personal property classified as commercial by the county assessor. This property, of which the major function was obviously residential, as supported by the property owner, was reclassified as residential.

entered the sample while eight counties were drawn systematically from the other two strata.

When individual properties were drawn from the files in each sample county different sampling rates were used in each county group and property type block.[1] For each property type within the individual counties, properties in the small size group were sampled at the highest rate and those in the large size group at the lowest rate. These rates were selected so that, for the entire state, properties entering the sample in the mercantile category are sampled at a 1/266 rate, those in the residential category at 1/1600, and those in the agricultural category at 1/600. There was some oversampling to replace schedules of the original sample which could not be used.[2] Since these were the rates at which property owners were sampled any property owned by a person that owns mercantile property was sampled at the mercantile rate. All properties owned by a person

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[1]Sampling procedures in counties filed by parcels differed somewhat from that used in counties filing each property separately.

[2]Reasons for eliminating original schedules might be (1) an inability to complete the interview because of refusal by the respondent or inavailability of a person with an adequate knowledge of the properties in question or (2) sampling rate adjustments when it was discovered that some properties had been given multiple chances to enter the sample. Schedules removed for the first reason required replacement, those removed for the second reason did not.

that owns agricultural property but no mercantile property,
were sampled at the agricultural rate. Residential
properties sampled at the mercantile rate were given a
weight of .1663, and those sampled at the agricultural rate
were given a weight of .3750, relative to the unity weight
given to those sampled at the residential rate. Agricultural
properties sampled at the mercantile rate were given a
.4433 weight relative to those sampled at the agricultural
rate. These rates were the ratio of the sampling rates,
1/266, 1/600, and 1/1600.

Assessment ratios were calculated through weighting
each property by the differential rate at which it entered
the sample, as given by the above sampling rates. This
method of aggregating assessment ratios gives each property
in the state an equal weight regardless of the property.
The formula used was

(1) $\bar{r}_i = (\sum_{j=1}^{n} w_{ij} r_{ij})/(\sum_{j=1}^{n} w_{ij})$, $j = 1, 2, \ldots n$ where

   $n =$ the number of economic units in subsample is i
       (where the subsample designates a particular
       county and property type block)

   $r_i =$ the weighted average assessment ratio for the
         subsample i

   $w_{ij} =$ the weight given to property j in subsample i

   $r_{ij} =$ the assessment ratio for property j in subsample i

An assessment ratio determined by the above equation is
for one property type classification and may apply to a
county, county group, or state assessment ratio. The weights

previously mentioned are used as the w_{ij} values with a
unity weight given to those properties sampled at the
same classification as their function. This procedure
allows aggregation over counties or county groups, but not
any combination over the three county type classifications.

The estimator, $\bar{r}_1$, of equation (1), which is used to
calculate the assessment ratios of SUB, is a biased
estimator of the population assessment ratio, R_1
(24, p. 107). Where R_1 is defined as

$$(2) \quad R_1 = (\sum_{k=1}^{m} a_{1k})/(\sum_{k=1}^{m} v_{1k}), \qquad k = 1,2,....m \text{ where}$$

      m = total number of economic units in the
            population of subsample i

      a_{1k} = assessed value of economic unit k in subsample i

      v_{1k} = "actual value" of economic unit k in subsample i

The value, $\bar{r}_1$, may be seriously biased as an estimator
of R_1 if r_{ij} tends to be larger (or smaller) for large
than for small v_{ij}. The calculation of R_1, however, seems
to be less meaningful for determining the behavior of
assessors when assessing properties as the meaningful units
here are the separate occasions of valuation. Thus, each
valuation is equally important and the relevant concept
might be called the population mean assessment ratio, $\widetilde{R}_1$,
calculated as

$$(3) \quad \widetilde{R}_1 = (\sum_{k=1}^{m} (a_{1k}/v_{1k})/m, \text{ where all terms are as defined}$$

in equation (2). For estimating R_1, r_1 is both an unbiased

and a consistent estimator.

The assessment ratio estimates used in REARS are weighted by the property values. The procedure used in calculating the REARS assessment ratio estimates is

$$(4) \quad \bar{r}_1^W = (\sum_{j=1}^{n} a_{1j})/(\sum_{j=1}^{n} v_{1j}), \quad j = 1,2,\ldots n \text{ where}$$

n = the number of properties sampled from subsample i
$\bar{r}_1^W$ = the value weighted estimator of the population assessment ratio for subsample i

As an estimator of R_1, $\bar{r}_1^W$ is biased, though, "the bias will not usually be large", (24, p. 107), and also consistent. As an estimator of $\widetilde{R}_1$, $\bar{r}_1^W$ is biased much more than as an estimator of R_1, with a particularly serious bias if r_{1j} tends to be larger (or smaller) for large than for small v_{1j}. That is, any positive, or negative correlation of assessment ratios with total property value will be reflected by a movement of the calculated ratio in the same direction, if the ratio is weighted by property value, such as in REARS. Also, $\bar{r}_1^W$ is not a consistent estimator for $\widetilde{R}_1$.

Even if we assume that r_{1j} tends to be the same for all values of v_{1j},[1] $\bar{r}_1^W$ is a biased estimator of $\widetilde{R}_1$ while $\bar{r}_1$ is not biased. That is, REARS (its estimator $\bar{r}_1^W$) gives the assessment ratio for a certain subset of the total population of properties and not an average assessment ratio

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[1] That is, for all values of v_{1j} the population mean and variance, of assessment ratios, are the same and these assessment ratios are normally distributed.

for a sample of individual properties.

All previous statements about the usefulness of the REARS estimate, $\bar{r}_i^w$, and the SUB estimate, $\bar{r}_1$, assume that the sample values are drawn randomly from a normally distributed population. SUB satisfies the randomness criterion while REARS probably does not do so. However, whether the distribution of assessment ratios, in the population, is normal is not known.

The Real Estate Assessment Ratio Study also gives the median assessment ratio of the REARS sample, in each classification, as an estimator of the actual ratio. Such a measure is more appropriate for determining the actual mean ratio at which properties are assessed than is the $\bar{r}_i^w$ value of REARS. However, even with a random sample the two measures are not alternative approaches to reaching the same value, as median and mean value have the same expected value only if the distribution of values (in this case the distribution of assessment ratios) is not skewed. The mean estimator also uses more of the total information in the sample than does the median.

While SUB is still probably a better measure than the median values of REARS, principally because of the nonrandom sample of REARS, and these median values are probably better than are the $\bar{r}_i^w$ values previously discussed, comparisons between the median assessment ratios and the SUB estimates of mean assessment ratios are not possible because there is

no way to aggregate the median values of REARS. Also, aggregation the other way is (1) impossible because of a lack of information, and (2) undesirable because such a disaggregation would result in a very small sample size. Therefore, comparisons of the two studies are made through the F_i and $\bar{r}_i^W$ values. Any further references to the REARS assessment ratios will mean the $\bar{r}_i^W$ and not the median ratio estimators.

Since the REARS assessment ratios, $\bar{r}_i^W$'s, are the total of assessed values divided by the total of sale prices, rather than the average of the assessment ratios for each individual property the REARS assessment ratio is most useful in aggregative discussions, such as the relationship of actual property value to legal debt limits. This may not be an accurate indication, however, of the mean assessment ratio which the assessor attaches to the property, as properties are actually weighted according to their value in determining the REARS assessment ratio.

RESULTS

REARS vs. SUB

The first problem faced when preparing a comparison of REARS and SUB is to make their categories compatible. REARS has a two part residential property and commercial property breakdown for each county. The first part is the county seat and the second part the remainder of the county. Each of the resulting four categories is further divided into warranty deeds and contracts. These properties constitute the first category of REARS, which is urban properties.[1] The other category, rural properties, is composed of rural improved, rural unimproved, and suburban residential, which are also further divided into warrenty deeds and contracts. The sales of all commercial properties and of all suburban residential properties for 1962 and 1963 are included in the 1964 figure to enlarge the sample size.

The first adjustment was the removal from the sample of all sales other than those which occurred in 1964. Since aggregation of values, from four commercial classes to one mercantile class and from six residential classes to one residential class, will make the sample size problem

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[1]Because of the small sample size of the nonurban commercial group, in many counties, REARS includes all properties which would naturally fall in this classification in the urban, remainder of the county, commercial group.

negligible, bias from comparing different time periods
becomes relatively more important. Residential property is
defined as the sum of the three different residential groups.
Agricultural property is the sum of the rural improved and
the rural unimproved categories. Warranty deed and contract
classifications, which double the number of property classes,
are aggregated in the regroupings.

Comparisons of the REARS and the SUB ratios for residential properties

Sale frequencies of mercantile and agricultural
properties are probably, in part, a function of the profits
from these properties. Thus those types of properties for
which the business outlook is bleekest (eg. small grocery
stores and small farms) will constitute a larger proportion
of sale properties than they do of the total population of
properties. Since the motives behind sales of residential
properties are linked much more with migration patterns,
rather than with any rate or level of profits, it is not as
likely that we will find a sample of sales properties
heavily weighted toward any particular groups of residential
properties. Indeed, a designation of groups of residential
properties according to function, or some other characteris-
tic, would be open to doubts of both its validity and its
value in explaining different assessment ratios. The
relatively continuous range of styles and values of
residential properties and their frequency in comparison to

mercantile and agricultural properties would seem, also, to lead to a more consistent and stable assessment procedure for these properties. Residential properties are both the most numerous and the most nearly homogenious group of properties dealt with by the assessor.

Making the assumption that sale properties, in the residential group, are a random sample of all residential properties, a comparison of the REARS and the SUB assessment ratios may point up any inherent biases in the SUB measure. The main inherent bias of SUB is expected to come from the method, owner valuation, by which market values of properties were arrived at. It may, of course, be that owners of residential properties were 1) more (or less) aware of the market value of these properties than owners of the other two types of property, or 2) motivated by different forces, or to a different degree, than owners of mercantile and agricultural properties, to place what they realized to be an unrealistic market value on their property. For these considerations, adjustments of SUB values will not be made unless there is a very significant difference in the values obtained by the two methods.[1] If there is a significant difference then extrapolating this bias to the

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[1]REARS and SUB samples are drawn from slightly different populations, as SUB residential properties include un-developed lots in residential areas, while REARS does not.

other property classes of SUB will allow a more accurate comparison of the two studies and make the SUB values more nearly reflect the true assessment ratios. Table 2 shows the assessment ratios found for residential properties in REARS, while Table 3 shows those found in SUB. In 19 of the 23 sample counties SUB gave a lower assessment ratio than did REARS, and in three of the four counties in which the SUB value exceeded the REARS value the difference was small. Observation of the raw data for the remaining county, Appanoose, shows an unusually large variance of individual assessment ratios. Thus, observation of the tables might lead to the conclusion that SUB values have a downward bias since property owners tend to value their properties at a greater price than their market value.

The information on assessment ratios for residential properties, from Tables 2 and 3 is subjected to a paired comparison, Student's t-test, under the null hypothesis that there is no significant difference between the assessment ratios obtained by REARS and those obtained by SUB.[1] The calculated t-value, 1.172, is not significant at the .05 level and does not become significant until

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[1] The formulas used in calculating the t-value are (26, p. 49).

$$D = X_1 - X_2 \quad \overline{d} = \Sigma D/n \quad d = D - \overline{d}$$

$$s_D = \sqrt{\Sigma d^2/d.f.} \quad s_{\overline{d}} = s_D/\sqrt{n} \quad t = (\overline{d} - \mu_D)/s_{\overline{d}}$$

Table 2. REARS assessment ratios, weighted by property value

	County	Ratio			Sample Size		
		Merc. (1)	Ag. (2)	Res. (3)	Merc. (4)	Ag. (5)	Res. (6)
SMALL	11	.2794	.2694	.2552	9	62	86
	12	.3033	.2324	.2574	5	61	139
	13	.3320	.3404	.2161	29	81	150
	14	.2992	.1995	.1967	12	44	174
	15	.5520	.2301	.2896	10	50	106
	16	.4612	.2507	.3203	4	67	93
	17	.2362	.2029	.2409	11	45	105
	18	.3463	.2416	.2694	18	87	342
	Total	.3203	.2327	.2448	98	497	1,096
MEDIUM	21	.4399	.2331	.2075	8	76	165
	22	.4147	.2131	.2427	21	78	552
	23	.2998	.2341	.1993	16	49	178
	24	.2589	.2152	.2220	35	66	667
	25	.3333	.2137	.2444	4	35	199
	26	.2423	.2428	.2170	12	70	209
	27	.2958	.2119	.2393	26	70	484
	28	.3722	.2211	.2192	9	125	256
	Total	.3033	.2211	.2290	131	569	2,710
LARGE	31	.2925	.2158	.2782	40	74	1,489
	32	.3057	.2450	.2386	28	50	721
	33	.3123	.2456	.2549	58	59	2,219
	34	.2467	.1817	.2284	138	50	3,308
	35	.2558	.2454	.2210	37	80	1,263
	36	.2838	.1851	.2152	58	43	1,976
	37	.3677	.2924	.2600	26	109	1,092
	Total	.2822	.2321	.2401	385	465	11,798

Table 3. SUB assessment ratios.

County		Ratio			Sample Size		
		Merc. (1)	Ag. (2)	Res. (3)	Merc. (4)	Ag. (5)	Res. (6)
SMALL	11	.1554	.2287	.1877	6	18	13
	12	.3010	.2036	.2111	15	16	33
	13	.3426	.2698	.2106	11	22	16
	14	.1622	.2369	.1792	11	17	24
	15	.3939	.2449	.3167	5	13	20
	16	.2853	.2414	.3187	6	31	28
	17	.5171	.1835	.2096	9	18	22
	18	.3507	.2332	.2683	5	31	29
Total		.3245	.2315	.2420	68	166	185
MEDIUM	21	.3088	.2100	.3833	2	12	15
	22	.3063	.1807	.2267	2	6	33
	23	.1858	.2009	.2091	3	9	13
	24	.1403	.1691	.1980	3	6	29
	25	.1048	.2161	.2517	1	15	16
	26	.2272	.2363	.1635	6	14	15
	27	.2166	.2186	.2171	13	8	35
	28	.1486	.2320	.1928	2	14	14
Total		.2147	.2145	.2279	32	84	170
LARGE	31	.2550	.2210	.2683	6	6	21
	32	_a	.2762	.2288	0	5	10
	33	.1456	.1060	.2101	2	6	26
	34	.2785	.3860	.2385	14	2	15
	35	.1656	.1426	.2171	7	2	15
	36	.1596	.1943	.2088	1	3	19
	37	.5268	.3848	.2168	2	8	22
Total		.2427	.2426	.2287	32	32	175

[a]Sample size of zero.

tested at about the .25 level.

Using the confidence interval approach, the 95 percent confidence interval, that is, the interval such that, unless a one-in-twenty chance occurred, we can say correctly that the true difference, μ_D, lies somewhere within the interval, is[1]

$$-.0086 \leq \mu_D \leq .0310.$$

Because of the low level of confidence that the SUB ratio estimates are biased downward, no adjustment of the SUB values will be made. In fact, simple observation of the more aggregative county size group totals would lead to this conclusion. Yet, in the further analysis, it will be best to consider that SUB values for residential properties may actually be lower than the true assessment ratios.

There may be reasons, other than the under-valuation of properties by property owners, for this possible difference of assessment ratios which is reflected in the residential properties. The assumption that the residential property sample, used by REARS, is a random sample may be fallacious. It is possible that the random sample of SUB contains a higher proportion of high valued properties, which are assessed at a lower ratio than are lower valued properties.

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[1]The formula used to calculate the confidence interval is (26, p. 48).

$$d - t_{.05}(s_d) \leq \mu_D \leq d + t_{.05}(s_d)$$

If higher valued properties have a lower assessment ratio[1]
the REARS estimates, because they are value weighted, would
tend to be lower than SUB and the population's average
ratio.

Properties that are often on the market may be more
easily assessed and assessed at a higher ratio than properties
which have remained in the same hands for a long time. If
REARS is composed of a larger proportion of these properties,
which are frequently sold, than SUB, a higher assessment
ratio would be expected from REARS. This effect is one,
however, that might be more likely expected in agricultural
properties where there may exist a correlation between
lengths of occupancy and farm size or mode of operation, or
particularly in mercantile properties where certain
businesses are much more unstable than others. Such an error
does not result from the estimates of market values, but is
rather one of the effects of the nonrandomness of REARS.
Such a reason for different values would thus be a
reflection on the inappropriateness of the assumption that
REARS estimates of residential assessment ratios gives the

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[1]The 1957 and 1962 Censuses of Governments (28, Tables
17 and 20) suggest that there is some inverse correlation
between the assessment ratios and the market values of single-
family nonfarm homes, over the entire nation. Frederick L.
Bird finds the same relationships (4, p. 59). A study by
James Morgan and others finds no perceptible correlation
(16, p. 293).

same results as an unbiased random sample and an adjustment
of SUB values would only implant in it the same bias. In
fact, a downward adjustment of the residential estimates of
REARS would be more appropriate.

Inter-county comparisons of REARS and SUB

When aggregated by county size group there is very
little difference in the residential assessment ratios
obtained by SUB and by REARS. From Table 2 and Table 3, in
the small group the figures were .2448 for REARS and .2420
for SUB, in the medium group .2401 for REARS and .2279 for
SUB, and in the large group .2290 for REARS and .2287 for
SUB. From these figures it appears that, on the whole,
the values which individuals placed on their residential
properties in the SUB survey were, in the aggregate,
consistent with the sale values of these properties.

This close correspondence of assessment ratios does
not, however, extend to each county of the sample, as there
is a wide dispersion of these assessment ratios. This dis-
persion may reflect 1) a bias of SUB because of a small sample
size, or 2) a bias of REARS because of the preponderance of
sales of certain property types, or of properties in certain
declining areas, in individual countries.[1] However the

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[1]Since neither the location nor the specific function
of property in the REARS study is available it is not
possible to check on these possible effects.

variance of the REARS and of the SUB estimates are
interesting in their own right, and may give some insight
into the actual cause of inter-county variations in
assessment ratios. Since the SUB intra-county sample size
is too small to be meaningful in inter-county measures with
the other classifications, only residential properties are
used.

Table 4. Inter-county variance of residential property
assessment ratios.

County size group	REARS	SUB
Small	.001529	.003064
Medium	.000286	.004487[a]
Large	.000817	.000443

[a]Without county 21, σ^2 = .000776.

Table 4 shows a wider inter-county variance of
assessment ratios in SUB than in REARS in both the small and
medium groups, but the opposite relationship in the large
group. At this point a somewhat questionable adjustment of
the SUB results is made by excluding the Appanoose, county
twenty one, residential assessment ratio from the calculation
of variance. This value is more than fifty percent higher
than the next largest value in the medium group and
contains less than nine percent of the sample values for

Table 5. Rank of small group counties for agricultural
          properties.

County	SUB		REARS	
	Rank	Ratio	Rank	Ratio
13	1	.2698	1	.2694
15	2	.2449	6	.2301
16	3	.2414	3	.2507
14	4	.2369	8	.1995
18	5	.2332	4	.2416
11	6	.2287	2	.2694
12	7	.2036	5	.2324
17	8	.1835	7	.2029

Table 6. Rank of small group counties for residential
          properties.

County	SUB		REARS	
	Rank	Ratio	Rank	Ratio
16	1	.3187	1	.3203
15	2	.3167	2	.2896
18	3	.2683	3	.2694
12	4	.2111	4	.2574
13	5	.2106	7	.2161
17	6	.2096	6	.2409
11	7	.1877	5	.2552
14	8	.1792	8	.1967

Table 7.   Rank of medium group counties for residential
          properties.

County	SUB		REARS	
	Rank	Ratio	Rank	Ratio
21	1	.3833	7	.2075
25	2	.2517	1	.2444
22	3	.2267	2	.2427
27	4	.1928	3	.2393
23	5	.2091	8	.1993
24	6	.1980	4	.2220
28	7	.1928	5	.2192
26	8	.1635	6	.2170

Table 8.   Rank of large group counties for residential
          properties.

County	SUB		REARS	
	Rank	Ratio	Rank	Ratio
31	1	.2683	1	.2782
34	2	.2385	5	.2280
32	3	.2288	4	.2386
35	4	.2171	6	.2210
37	5	.2168	2	.2600
33	6	.2101	3	.2549
36	7	.2088	7	.2152

the medium group. It appears that Appanoose county is a very unusual case and not representative of the other medium size counties, or the sample was, unfortunately, not at all representative of the population from which it was drawn. Either of these reasons is, of course, sufficient to remove Appanoose county from inter-county analyses.

These variances for both SUB and REARS reflect, as expected, a wider variance of assessment ratios in the small county group than in either of the two larger groups. A possible cause of this result may be that assessments in smaller counties are made by a small crew of assessors, perhaps only one, while assessments in larger counties are made by a number of assessors. Thus, personal bias is reflected more in small county ratios than in those for larger counties. Better training of the larger county assessors may be another reason for the different variances. However, if such is the case this effect should be quickly losing importance as counties are rapidly shifting to the contracting of professional assessors.

The lower variance of REARS can be explained by its nonrandom sample which is weighted toward those property types with a high turnover rate in the period of the study. SUB, meanwhile, contains a random sample of properties and, thus, reflects more truly the types of property existing within each county. The lower variance of SUB for properties

in the large county group then suggests a more nearly similar composition of residential properties in the urban, large size counties, than in the smaller county sizes.

The previously mentioned adjustment of SUB, while moving SUB variance values nearer to those of REARS, does not reach the conclusion, as does REARS, that the lowest variance occurs in medium sized counties. In fact, the SUB values now give the anticipated result that inter-county variance of assessment ratios, for residential properties, is a decreasing function of the county size group.

Comparison of SUB and REARS by rank

Tables 5 through 8 give the ranks of counties, from highest to lowest assessment ratio, for both SUB and REARS. It is hoped that some compatability, hidden in direct comparisons of assessment ratios, will be brought out in this manner. The four county group and property type blocks thus treated are the only ones for which the SUB sample size, for each county, is large enough to give these values creditability.

To test the closeness of these rankings a non-parametric method for rank correlation, as devised by Spearman and repeated by Snedecor[1] (26, p. 190), was used.

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[1]The formula used for samples of eight or less is, $r_s = 1 - (6 \sum d^2)/(n(n^2-1))$. These values are compared against a table of significant values in Table 7.12.2 of Snedecor (26, p. 191).

The calculated values and the appropriate significance levels are given in Table 9.

Table 9. Rank correlation comparisons for SUB and REARS.

County groups	Property type	r_s	5% level	1% level
Small	Agricultural	.357**	.717	.857
Small	Residential	.905**	.717	.857
Medium	Residential	.286	.717	.857
Large	Residential	.429	.750	.893
All groups	Residential	.522**	.404	.515

**Significant at the .01 level.

The significance levels of five percent and one percent mean, respectively, that there is about a five percent chance and a one percent chance of getting this value even if there is no correlation between the values of REARS and those of SUB.

As shown, although only the small residential group ranks are significant, this is at the one percent level. This strong correlation of ranks in the small county and residential property block might seem to be a surprising result. This may, however, be viewed as an indication of a sample which is more nearly random in this division of REARS than in most of the other divisions.

None of the other three groups were found significant at even the five percent level. However, simple observation

of the ranks, in Tables 4 through 7, might lead one to conclude that there is some correlation even if it is not significant at the five percent level. To check for a correlation of rank, in the aggregate, the same non-parametric test for rank correlation was run for the residential assessment ratios of all twenty-three REARS and SUB counties. The calculated r_s value of .522 was significant at the one percent level, verifying that the SUB and REARS rankings are indeed correlated.

SUB Results

The results of the SUB study are important, apart from their reflections on REARS. The random sample of SUB opens to analysis all properties in the state[1] and allows each of these properties a predetermined probability of entering the sample. Thus the SUB values give an accurate view of the assessment picture.

Results of SUB for residential properties

The SUB sample of residential properties, because of the sampling procedure, was larger than the total of all other sampled properties and was of nearly equal size for each county size group. Because of the three weights which

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[1]Unfortunately for this study the sample used here excludes all corporate properties and properties owned entirely by non-Iowans, from the sampled population.

which were given to the individual residential properties, statistical comparison of the ratios, taking account of the sample size, was not within the scope of this study.

Observation of the county group assessment ratios shows nearly identical values, of .2287 for the large group, and of .2279 for the medium group, while the small group ratio of .2420 is larger than that of the other two. This higher ratio for small counties appears to be significant, but does not appear to be a general property of all the smaller counties. The reader can draw his own conclusions on these points, by observation of Table 2.

It seems appropriate to make an analysis of the inter-county variance of assessment ratios for these residential properties. Figure 2 plots the assessment ratio for residential properties against the population of the largest town in each of the sample counties. Population of the largest town was used as it was the criteria previously used to assign counties to one of the three size groups. It can be viewed as a surrogate for either total population or population density, but is a rather poor measure of both.

On observation of the table values, one sees an apparently more stable relationship in the larger population counties. However, the plotted data, instead of showing the three groups, under which the sample was drawn, seems to

Table 10. SUB counties and largest towns with residential assessment ratios.

County number	County name	Largest town	Population of largest town	Assessment ratio
11	Allamakee	Waukon	3,639	.1877
12	Buchanan	Independence	5,498	.2111
13	Crawford	Denison	4,930	.2106
14	Dickenson	Spirit Lake	2,685	.1792
15	Fremont	Hamburg	1,647	.3167
16	Guthrie	Guthrie Center	2,071	.3187
17	Humbolt	Humbolt	4,031	.2096
18	Washington	Washington	6,037	.2683
21	Appanoose	Centerville	6,629	.3833
22	Cerro Gordo	Mason City	30,642	.2267
23	Cherokee	Cherokee	7,724	.2091
24	Clinton	Clinton	33,589	.1980
25	Dallas	Perry	6,442	.2171
26	Jefferson	Fairfield	8,045	.1635
27	Marshall	Marshalltown	22,521	.2171
28	Warren	Indianola	7,062	.1928
31	Black Hawk	Waterloo	71,755	.2683
32	Dubuque	Dubuque	56,606	.2288
33	Linn	Cedar Rapids	92,035	.2101
34	Polk	Des Moines	208,982	.2385
35	Pottawatamie	Council Bluffs	55,641	.2171
36	Scott	Davenport	88,981	.2088
37	Woodbury	Sioux City	89,159	.2168

Assessment Ratio (x10^{-2})

50

40

30

20

10

1.5   2   2.5 3 3.5 4   5   6   7 8 9 10   15   20   25   30 35 40   50   60 70 80 90 100   150   200
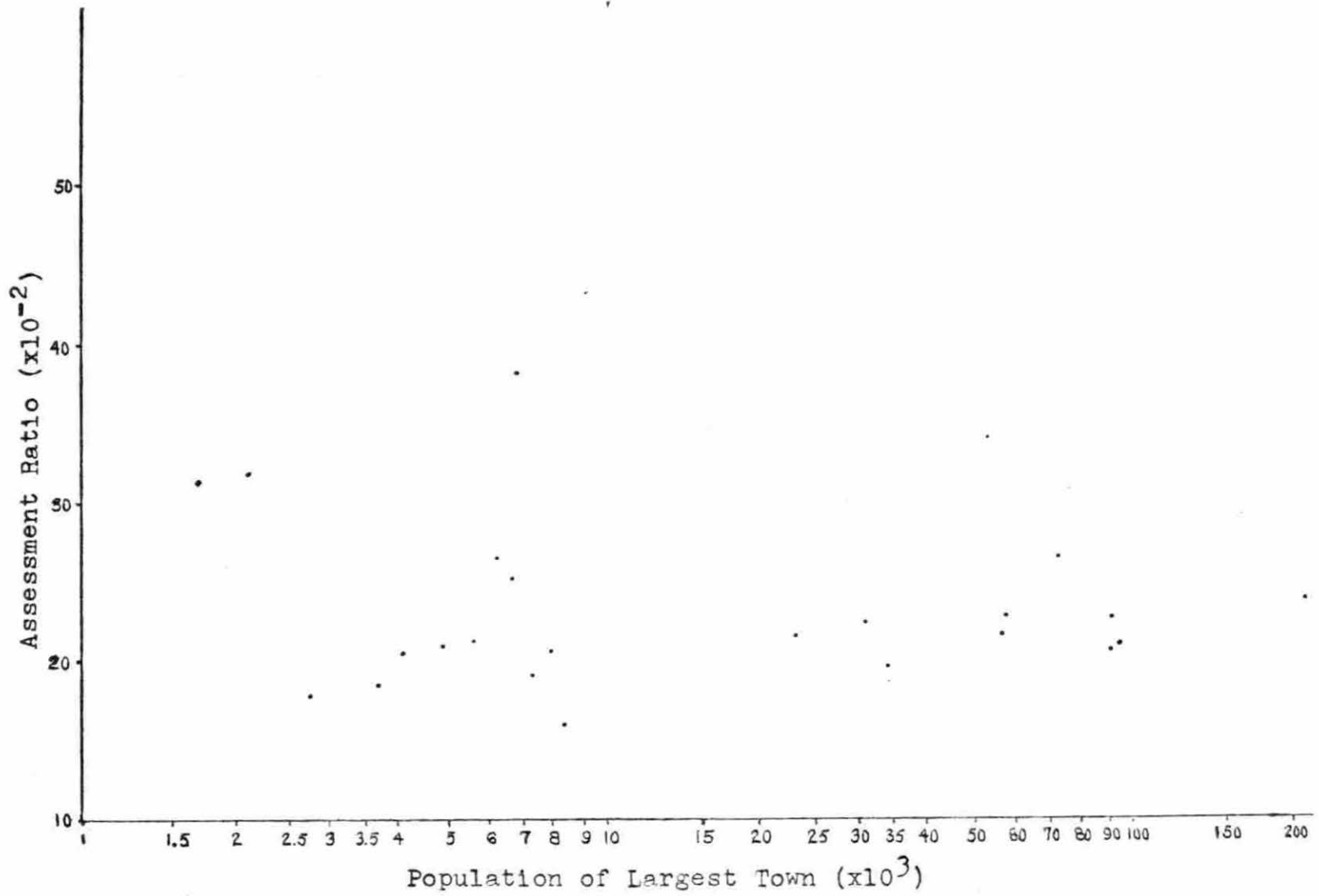
Population of Largest Town (x10^3)

Figure 2.   SUB assessment ratios.

lump the counties into a high population group and a low population group. This new high group, which contains Cerro Gordo, county 22, Clinton, county 24, and Marshall, county 27, in addition to the seven large size group counties, shows a much more stable inter-county assessment ratio than does the low group, which is composed of the remaining counties. Since the sample size of all the county size groups are nearly the same this stability difference can not be attributed to smaller samples in the small than in the large counties. Thus, it must reflect actual differences in inter-county variance of residential assessment ratios.

Here, again, small sample size makes similar analyses of the other property types essentially meaningless, although possible.

Results of SUB for mercantile and agricultural properties

To this point little has been said about the SUB estimates of assessment ratios for either mercantile or agricultural properties. The sample, which was designed to select nearly equal numbers of owners of each of the three property types, via the hierarchical framework, which, as explained earlier, included all properties of each individual, made it inevitable that residential properties would outnumber agricultural and mercantile properties and that agricultural properties would outnumber mercantile

properties.[1] Because of this result of the sampling
procedures few comparisons are made between individual
counties in these two property classifications.

In the mercantile category the small group had a much
higher overall assessment ratio than either of the other
two groups. What might be seen as a surprising result is
the medium group ratio which is about ten percent lower
than that of the large group. The entire difference of the
two ratios could be attributed to the high ratio in Polk,
county 34,[2] as its removal from the large group gives a
ratio, for the remaining large counties, which is nearly
identical to the medium group figure. Thus, with mercantile
properties as with residential properties, there is a
perceptively higher assessment ratio in small counties than
in the other two groups, while the relationship of the
medium and large county groups is not nearly as easily
identified.

In the agricultural category there are no differences
nearly as large as those in the mercantile category. The

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[1]If few owners of mercantile properties also owned
agricultural properties then nearly the same number of
both would be expected. This is reflected in the large
county group where thirty-two properties of each of the two
types are sampled.

[2]The sample is heavily weighted toward the Polk figure
as fourteen of the twenty-three properties in the large
group sample are in Polk county.

ranking finds the large group with the highest ratio, .2426, the small group in the middle, .2315, and the medium group lowest, .2145.

Justification of these results for agricultural properties appears to be largely a matter of speculation. Thus, if the reader desires a theoretical structure he is left to his own devices to develop one. These results for agricultural properties are a case where attempts at explanation seem far afield and it is probably best to accept the results as given and refrain from unfounded speculation as to the underlying causes.

Results of SUB across property types

SUB is important for its reflections on the ways in which different property types are treated within a specific assessing area. Again, because of the sample size problem, the only comparisons made are by county size group. The large and medium groups show surprisingly close values for mercantile and agricultural properties, within the respective size groups. The residential ratios, although different, are only about five percent higher than the other ratios for the medium group and about five percent lower for the large group. The only outstanding difference occurs in the small county group where the mercantile ratio is about forty percent higher than the agricultural ratio and about thirty-four percent higher than the residential ratio.

CONCLUSIONS AND RECOMMENDATIONS

SUB vs. REARS

It has been shown that, while there is a strong correlation between the assessment ratios of SUB and REARS, particularly in the order in which they rank counties, there is also a significant difference in the results. The significance of this difference reflects that the sales sample, although of definite value for approximating the actual average ratios, and particularly the relative ranks among counties as they would be found by a random sample of all properties, is not completely efficient in this function. Any adjustments of the REARS values, based on the SUB results, to make them more nearly reflect the actual assessment procedure, cannot be accurately suggested on the basis of this study, which covers only one time period. Only adjustments made on the basis of long-run phenomenon or trends, and not based on short term market conditions, should be used. Indeed, samples based on sales properties may always be, in large part, reflections of short-run market fluxuation. Even if these problems did not exist, adjustments with some formula would require separate analyses for each county because of the differences in population composition. Therefore, no suggestions are made for adjustments of future REARS estimates based on the SUB results.

The comparison of REARS and SUB reflects, in the norm, on how good an approximation of the actual average assessment ratio the REARS sales sample gave in each of the property type groups, county size groups, and in some cases between individual counties. As postulated, before any results were tabulated, the REARS estimates for residential properties are generally close to those of SUB although far from identical. The REARS estimates for agricultural properties, although different again from the SUB values, do not, for county group comparisons, show a large difference. The largest bias of the REARS sample appears to be for mercantile properties in the medium and large size counties where the REARS sales properties show a much higher assessment ratio than do the randomly sampled properties of SUB. This result is counter to the conclusion, which would be reached by REARS, that in most counties, regardless of the county size group, mercantile properties are assessed at a higher proportion of market value than are other types of property. SUB shows a fairly constant assessment ratio, particularly over mercantile and agricultural properties, for large and medium size counties, and no appreciable bias toward higher assessments of mercantile properties. Only in the small counties are the REARS results for mercantile properties compatible with those of SUB as in both studies mercantile properties are assessed at a higher ratio than

other types.

Sampling Problems

The sample from which SUB was drawn was, as stated earlier, designed to, determine among other things, the incidence of the property tax. As such the sampling unit was the household, rather than individual properties. This procedure was far from optimum for the uses made of the data in the SUB assessment ratio estimates. The chief faults of the sample used were, 1) it generally oversampled residential properties relative to agricultural and mercantile properties and agricultural properties relative to mercantile properties, 2) it introduced possible multicolinearity, that is, inter-correlation of ratios treated as separate observations, which may result through owner bias in valuing properties, or through individual holdings of similar or complementary properties, 3) it introduced weighting problems which greatly complicated computation techniques, and 4) it excluded some properties from consideration because they were owned by corporations or by persons living in nonsample counties or in other states.

Ratio Adjustment of REARS

At this point a ratio approach to adjusting the REARS values, which may be feasible and result in an increase in their accuracy, is suggested. This method requires

identification of the significant parameters within each of the county, property type blocks. Then the REARS values are adjusted according to the proportion of properties with the same mix of parameters in the sampled population. This could be represented as

$$(5) \quad r_{ij} = \sum_{x_1} \left(\left(\left(\sum_{k} a_{ijx_1x_2----x_n}k \right) / m \right) w_{ijx_1x_2----x_n} \right) /$$

$$\sum_{x_1} w_{ijx_1x_2----x_n} ,$$

$k = 1,2,....m$ where

r_{ij} = assessment ratio in county i for property j

$p_{ijx_1x_2----x_n}$ = number of properties in the county i, property type j, parameters $x_1....x_n$ block

$s_{ijx_1x_2----x_n}$ = number of properties sampled in the county i, property type j, parameters $x_1....x_n$ block

$a_{ijx_1x_2----x_n}k$ = assessment ratio of sale property k in the county i, property type j, parameters $x_1x_2....x_n$ block

$$w_{ijx_1x_2----x_n} = s_{ijx_1x_2----x_n} / p_{ijx_1x_2----x_n}$$

x_1 = all possible combinations of the x_i parameters

This is a stochastic process which necessitates identifying the significant parameters and classifying all properties with respect to these variables. It is necessary that, while all relevant parameters be considered, this

number be limited to the few most relevant variables.
Indeed, if all possible parameters were considered each
property would be considered as a class of one and the
analysis would degenerate to a simple averaging of the
ratios for individual properties. The same would be true
if the properties were not differentiated by the x_1
parameters.[1]

Suggestions for Further Study

Identification of the significant parameters, as
discussed for the ratio adjustment procedure, and the
level of their significance would be a fruitful area for
further study. This division procedure is suggested rather
than a regression analysis to establish regression
coefficients since, 1) the adjustment by a formula, with
parameters established by regression analysis may be
highly biased without the use of time series data, and 2)
some of the significant variables may not be quantifiable

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[1]It is also necessary, when parameters of a continuous
nature are identified, that significant finite divisions be
established to form a determinant number of parameter cells.
The number of divisions should be kept as small as possible
to keep the number of cells within a reasonable range. In
fact, as the number of cells is $\prod_{i=1}^{n} N_i$, where $N_i =$ the number
for parameter, i, it becomes desirable to keep both the
number of parameters and the number of divisions of each
parameter quite small, as each increment to either doubles
the previous number of cells.

(eg. whole sale trade vs. retail trade). The use of such
a study, if it shows that adjustments are feasible, would
require the collection of information on the parameters,
for each sale property and for the population as a whole.

Suggested Changes in the Iowa Property Tax Structure

Changes in the legal structure

It is evident that there is need for changes in the
legal requirements that assessments be made at sixty
percent of actual value, and that local borrowing power
be limited to five percent of assessed valuation.
Improvement of the sixty percent assessment requirement
might be achieved by lowering the requirement to the
existing assessment ratio of about twenty-five percent.
A preferred method would be to require the assessment of
all properties at the same ratio which could be set by
the State Tax Commission, to correspond with existing
situations. Control by the State Tax Commission might be
exercised by requiring reassessment of certain properties
or groups of properties as is done at present.

Whether it is desirable to tie local borrowing power
to the value of local property is questionable. However,
the limitation of borrowing power by the ratio of the
total assessed property value to the assessment ratio
(i.e. actual value) is a more meaningful bound than the
current limit of five percent of the total assessed value

over all property. Also the changing structure of local
responsibilities and credit availability make elimination
of the constitutional requirement and its replacement by
a statutory requirement desirable. This would increase
flexibility without weakening state control of local units.

Changes within the present legal structure

Both REARS and SUB present conclusive evidence that
mercantile properties in small counties are assessed at a
significantly higher proportion of actual value than are
other types of property in these same counties. The State
Tax Commission should use its power to require reassessments,
either individual reassessments or blanket adjustments, in
groups where such inequities are evident. Not only would
such reassessments correct an existing inequitable
situation but they may also point up to the local areas
often repeated errors in assessment and induce them to be
more accurate in the future.

While blanket adjustments are not as equitable as
reassessment of individual properties they may be the only
feasible alternative for mass adjustment of assessment
values and probably are preferable to retaining a grossly
inequitable status quo. Evidence of the inadequacy of
using a blanket adjustment of all assessed values to reach
the desired aggregate assessment ratio, is indicated in
Table 11. These upper and lower bounds on the range of

Table 11. Range of assessment ratios from SUB

	County	High	Low
SMALL	11	.3824	.0519
	12	1.3604	.0579
	13	1.7999	.1016
	14	.9043	.0184
	15	.8333	.0721
	16	.6073	.0971
	17	.4199	.1037
	18	.6626	.0899
MEDIUM	21	.8979	.0599
	22	.5489	.0052
	23	.3034	.0536
	24	.2806	.0032
	25	.4391	.0128
	26	.4308	.0433
	27	.7119	.0086
	28	.5555	.0059
LARGE	31	.5859	.0300
	32	.3291	.1596
	33	.2792	.0129
	34	1.3999	.0006
	35	.4014	.0554
	36	.3239	.1318
	37	.8999	.1089

assessment ratios, over all property types, within each
county in the SUB sample, indicate that unequal assessments
among the individual properties may be a much larger
problem than unequal assessments between groups of property
owners. While a blanket adjustment would operate only to

eliminate the latter problem (in relative but not in absolute terms) individual reassessments would operate on both dimensions of unequal assessment ratios.

SUMMARY

Equity considerations of the assessment of real properties, as part of the administrative machinery of the property tax mechanism, should not be criticized on the same basis as the equity attacks which are often leveled at the property tax, itself. The goal of the assessment process should be that ascribed to it by the goals of the property tax mechanism, that is, to attach to each property a value which is, for all properties, an equal percentage of the fair market value, so as to tax, in the local area, at a constant proportion of this market value. Although at first consideration it may seem to be necessary that assessment ratios be equal within the local district really more than the local district needs to be considered. State assessments, credits, and debt restrictions, make inter-district assessment ratio inequalities important.

This study was concerned with inter-county and intra-county assessment ratio equality and inequality. The assessment ratios were examined by county, with concern shown for size of county, and for property type. The study also reflects upon REARS, the only study of Iowa real properties which is conducted annually for all counties. Since the stratified random sample of SUB was not ideally suited to the uses which it was put here, the only meaningful comparisons between individual counties are

made in residential properties, and in agricultural
properties in the medium county group. Other comparisons,
because of inadequate sample size for individual counties,
are made only on the county size group basis. Properties
were selected for the sample on the basis of their owners,
as each owner had one chance to be drawn and thus each
property owned by the individual had the same chance to
enter the sample as did the owner. Property owners
entered at different sampling rates, with owners of
mercantile property sampled at the highest rate, owners of
agricultural but no mercantile property sampled at a
lower rate, and owners of only residential properties at
the lowest rate. Thus, the SUB assessment ratios are
weighted averages with each property weighted by the
weight given the owner, with no weighting consideration to
property value. In comparison, the REARS ratios are
simple averages of assessment ratios for sale properties,
which are weighted by property value.

There were slight differences in the properties which
were included in SUB and REARS. Adjustments were made for
as many of these differences as possible. It was concluded
that each individual case of assessment should be given an
equal weight, rather than weighted by property value, to
give the most accurate indication of the performance of the
assessment machinery within each block evaluated. As REARS
ratios are weighted by property value, if there is any

correlation between the assessment ratios and property value these ratios become biased estimators of the mean assessment ratio, while the SUB ratios are unbiased estimators.

Comparisons of SUB and REARS ratios for residential properties were made, under the assumption that, for the residential group, sales properties were of approximately the same composition as a random sample of all residential properties. The object of this comparison was the detection of any consistant bias on the part of individual property owners to value their properties at some figure different than the actual market value. A t-test of the differences in the REARS and the SUB values found that, at the .05 level, the difference, in the two estimators, was not significant. The ninty-five percent confidence interval for an actual difference in the ratios of the two studies, μ_D, is, $-.0086 \leq \mu_D \leq .0310$. This showed that, if a bias existed, it was more likely that the SUB values were biased downward. Even if a significant difference were found at the .05 level the unspecified character of the cause for the difference, and problems of a possible time relationship, would still have made adjustments of SUB values of doubtful creditability. Also, there would have been little foundation for extrapolation of such adjustments to other property types.

Both the SUB and REARS ratios showed a much larger

inter-county variance in the small county group than in the large county group. The inter-county variance of medium sized counties, in relation to the other two size groups, is best described as indeterminant.

The order in which SUB and REARS rank counties, according to their assessment ratios was tested and it was concluded that, at the 1% level, there was a correlation in the rankings of residential properties. When the same analysis was made for individual counties, within county size groups, a strong correlation was found only in the small county group. However, this test was hampered by the small number of counties within each group.[1]

The results of SUB suggest that, in the aggregate, the small counties assess residential properties at a somewhat higher ratio than do medium and large size counties which assess at about the same ratio. This result should not be extrapolated to individual small counties, however, as a wide variance of residential assessment ratios was shown among the small counties. This variance for large counties, on the other hand, was relatively small.

Meaningful results of SUB for agricultural and mercantile

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[1]The same test was run for the small county agricultural property block, which was the only other which was deemed to have sufficient sample size for each county to make comparisons meaningful, and no significant correlation was found in this block, again, owing at least partially to a small sample size.

properties were limited to comparisons between county size groups. In the agricultural category large counties had the highest assessment ratio at .2426, while small counties were next at .2315, and medium counties last at .2145. For mercantile properties the large and medium counties showed relatively low ratios of .2427 and .2147, respectively, while small counties showed a quite high ratio of .3245. While these figures were much lower than those of REARS in the medium and large groups the small county figure is nearly the same.

While some difference in assessment ratios was apparent, within county size groups, between the values for the three property types, by far the largest difference occurred in the small county group where the .3245 ratio for mercantile properties greatly exceeded the .2315 ratio for agricultural properties and the .2420 value for residential properties.

A ratio based adjustment procedure, for the sales property sample, is suggested, which does not make direct use of the results of the SUB study. This adjustment procedure would weight each sale property's assessment ratio by the proportion of the total population that its block composes. These blocks are identified as all possible combinations of parameters which are shown to be the most important determinants of assessment ratio differences. Adjustments on the basis of SUB are rejected on several

grounds, the most important of which are, 1) the possible short run nature of the real property market as reflected in the composition of the sales property sample, 2) problems of a possible time trend, and 3) widely differing compositions of properties within counties which would require separate determinations of adjustment formulas for each county.

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