

# Assessment Regressivity and the Homestead Exemption

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## Abstract

The statutory incidence of the property tax is not regressive across jurisdictions when regressivity is defined as having higher effective tax rates for lower-valued properties. However, a long-standing tendency toward higher assessment rates for low-priced homes commonly leads to a regressive tax structure. Using CoreLogic data, we calculate the size of the homestead exemption that would eliminate regressivity for 9,091 municipalities, of which the vast majority (92.3%) have at least somewhat regressive assessment practices. The median value of the required exemption is \$24,639, and the inter-quartile range is \$10,270 - \$47,512.

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# 1 Introduction

Statutory property tax rates do not vary with property value in the United States. In many jurisdictions, taxes are simply proportional to the assessed property value, i.e.,  $T = tA$ , where  $T$  represents the tax payment,  $A$  is the assessed value, and  $t$  is the tax rate. Some states allow various exemptions, the most common being a general homestead exemption, which reduces the tax base by the amount of the exemption,  $E$ . The tax becomes  $T = \max(0, A - E)$ , which implies a progressive tax structure per dollar of assessed value: the first \$E is not taxed, which leads to a higher effective tax rate for higher-priced properties. Homestead exemptions can be significant. For example, the homestead exemption for the fiscal year 2023 is \$470,823 in Cambridge, MA. Although other exemptions are sometimes available, such as special exemptions for senior citizens or veterans, they typically are relatively small in jurisdictions with homestead exemptions. Apart from these special exemptions, the typical tax structure for the residential property tax is progressive when progressivity is defined as a system with higher tax rates for higher-priced properties.

Even in a jurisdiction with a progressive tax structure, the incidence of the property tax may prove to be regressive if assessments are regressive in the sense that high-priced properties are assessed at lower rates than low-priced properties. There is a large literature documenting the tendency toward lower assessment rates for high-priced properties.<sup>1</sup> This tendency toward assessment regressivity also leads to a tendency toward higher assessment rates for any demographic group that tends to purchase relatively low-priced homes. The tendency for higher assessment rates for African-American households is discussed in [Baar \(1981\)](#), and has since received attention again due to the work of [Avenancio-León and Howard \(2022\)](#). Although, ultimately, the incidence of the property tax depends on the relationship between housing expenditures and income, the relationship between assessment rates and property values is the critical starting point for the analysis. [Ihlanfeldt and Rodgers \(2022\)](#) find that the degree of assessment regressivity is sufficient to reverse the statutory progressivity of the property tax in large American cities, and this result holds whether regressivity is defined as higher tax payments per dollar of home

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<sup>1</sup>Examples include [Amornsiripanitch \(2021\)](#), [Avenancio-León and Howard \(2022\)](#), [Berry and Bednarz \(1975\)](#), [Berry \(2021\)](#), [Cheng \(1974\)](#), [Clapp \(1990\)](#), [Haurin \(1988\)](#), [Hodge et al. \(2017\)](#), [McMillen \(2011\)](#), [McMillen \(2013\)](#), [McMillen and Weber \(2008\)](#), [Paglin and Fogarty \(1972\)](#), [Quintos \(2020\)](#), [Sirmans et al. \(1995\)](#), and [Sirmans et al. \(2008\)](#).

price or household income.

This tendency for regressive assessments to produce regressive property taxes can be attenuated or even reversed given a sufficiently high homestead exemption that applies to all (or at least most) residential property. [Ihlanfeldt and Rodgers \(2022\)](#) find that Florida’s homestead exemption of \$25,000 for the first \$50,000 of the property value (which applies to all property taxes, including school district taxes) and an additional exemption of up to \$25,000 for only non-school taxes for values between \$50,000 and \$75,000 (a highly unusual tax structure) is sufficient to reverse the tendency toward regressive assessments (although [Ihlanfeldt \(2021\)](#) documents a tendency toward lower take-up rates for the exemption among owners of low-priced properties, which reduces the effectiveness of Florida’s homestead exemption).

Our objective in this paper is to measure the size of the homestead exemption that would be required to eliminate the property tax regressivity that is associated with assessment regressivity. We maintain a stylized tax structure in which taxes are proportional to assessed values minus a homestead exemption that is common to all residential properties. Our data set includes assessed values and sales prices from two data sources. The first data set includes all residential sales for Cook County, IL, for 1980 - 2022. This high-quality institutional data set allows us to observe changes in assessment practices over a long period of time. Our second data source is CoreLogic, which provides data on sales prices and assessments for the entire US. For CoreLogic, we use data for a single tax year (typically 2016 or 2017). We use a Suits index ([Suits, 1977](#)) to measure the regressivity of the tax base that is implied by a simple tax structure in which all homeowners in a jurisdiction claim the same homestead exemption. We vary the level of the homestead exemption to find the value that eliminates any regressivity.

For Cook County, we find that the degree of assessment regressivity varies markedly over time. There have been times where assessments have not been regressive, and others where the degree of regressivity is extreme. The degree of regressivity has been most extreme during recessions, particularly during the Great Recession. The tendency for assessments to be regressive in recessions is due in part to Cook County’s three-year assessment cycle: assessments remain high even as prices fall because assessments are calculated with a lag using historical data on sales, and only 1/3 of the county is reassessed in a year. We find that moderate exemptions can eliminate the regressivity in normal years,

and even in the worst of recession years, a modest exemption can significantly reduce the degree of property tax regressivity.

In our sample of 9,091 municipalities, we find that the vast majority (92.3%) have at least mildly regressive assessments. As is the case for Cook County, this regressivity can be purged from the tax base using homestead exemptions that typically are moderate: the median value is \$24,639, and the inter-quartile range is \$10,270 - \$47,512. The exemptions are not out of line with the levels that exist in many states, and they compensate for the long-standing tendency toward higher assessment rates for low-priced properties.

## 2 Assessments and the Property Tax

A simple simulation exercise illustrates the relationship between assessments, property taxes, and the level of exemption that eliminates regressivity in taxes. First, we set the sale price ( $P$ ) to a set of 1,000 values ranging from \$100,000 to \$2,000,000 in equal increments. Assessments are proportional to the sale price if they are accurate, with the proportion determined by local statute. While many jurisdictions require properties to be assessed at market value, others have lower rates. For example, small residential properties in New York City and Chicago are supposed to be assessed at 6% and 10% of market value, respectively. Ohio requires residential properties to be assessed at 35% of market value, while Missouri's statutory rate is 39%. For the purposes of this exercise, we assume that the statutory assessment rate is 100%.

We use the log-linear relationship  $\ln A = a + b \ln P$  to define assessments, and set  $b = 0.6$  and  $a = (1 - b)\bar{p}$ , where  $\bar{p}$  is the mean of  $\ln P$ . This specification assures that the assessment ratio,  $A/P$ , is higher for low-priced properties and that the mean of  $\ln A$  is equal to the mean of  $\ln P$ . The value for  $b$  is chosen to ensure that the relationships depicted in the graphs are clearly visible, which requires a very high degree of regressivity. The relationships between the log assessed value, the assessment ratio, and the log sale price are shown in Panel 1 of Figure 1 for both the simulated regressive values (i.e., the curve denoted by Regressive) and the values if assessed values were equal to the sale price (i.e., the curve denoted by Statute). As can be seen in the graph on the right in Panel A - if assessments were done following the statutory procedure assessment ratio would be constant at 1. However, if the assessment practices are regressive - the assessment ratio is

high at low sale prices and low at high sale prices.

The traditional measure of assessment regressivity is the *price-related differential* (or “PRD”), which is the ratio of the arithmetic mean assessment ratio to the value-weighted mean ratio (i.e., weighting each ratio by the sale price). Assessments are generally considered to be significantly regressive if  $\text{PRD} > 1.03$  ([International Association of Assessing Officers \(2017\)](#)). The PRD of 1.178 for our simulations indicates that assessments are highly regressive.<sup>2</sup>

The property tax ( $T$ ) is a simple function of the tax rate ( $t$ ), the assessment ratio ( $m$ ), the assessed value ( $A$ ), and the exemption ( $E$ ):  $T = t \max(0, mA - E)$ . When assessments are equal to the sale price, we set  $t = 0.01$  and  $m = 1$ , so  $T = 0.01 \max(0, A - E)$ . When assessments are regressive, we set  $m = 1/\text{median}(A/P)$  to ensure that the median value of  $mA$  is equal to the median value of  $P$ , and we choose  $t$  to ensure that the same amount of revenue is raised as when assessments are equal to the sale price.

Figure 1 shows the effective tax rates implied by the simulated data. The exemption is set to either \$250k or \$500k, or about 25% or 50% of the mean sale price. The left graph of panel B of Figure 1 shows that when assessed values are accurate, the effective tax rate does not vary with the sale price in the absence of an exemption. Exemptions lead to a progressive tax structure: the effective tax rate is 0 up to the level of the exemption, after which the rate rises rapidly with the sale price until it begins to level off. Since the minimum value of  $A/\text{median}(A/P) = \$256\text{k}$ , the \$250k exemption does not exclude any homeowners from the full tax payments.

When assessments are regressive, as shown in the right graph of panel B of Figure 1, without exemptions, the effective tax rate is high at low sale prices and gradually decreases as the sale price increases. However, a homestead exemption of \$250k is sufficient to produce an initial range of progressivity at low sales prices, although the high degree of assessment regressivity eventually leads to declining effective tax rates at relatively high sales prices. An exemption of \$500k produces a range of sale prices where tax payments are zero, after which the effective tax rate rises with the sale price.

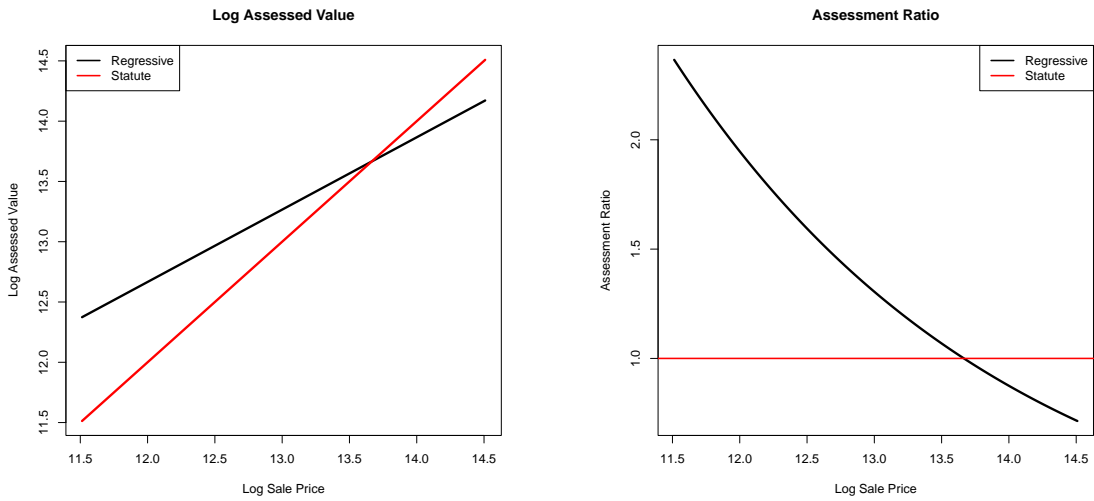
We use a standard measure of tax progressivity, the Suits index ([Suits, 1977](#)) to determine the exemption level that eliminates the regressivity induced by the regressivity

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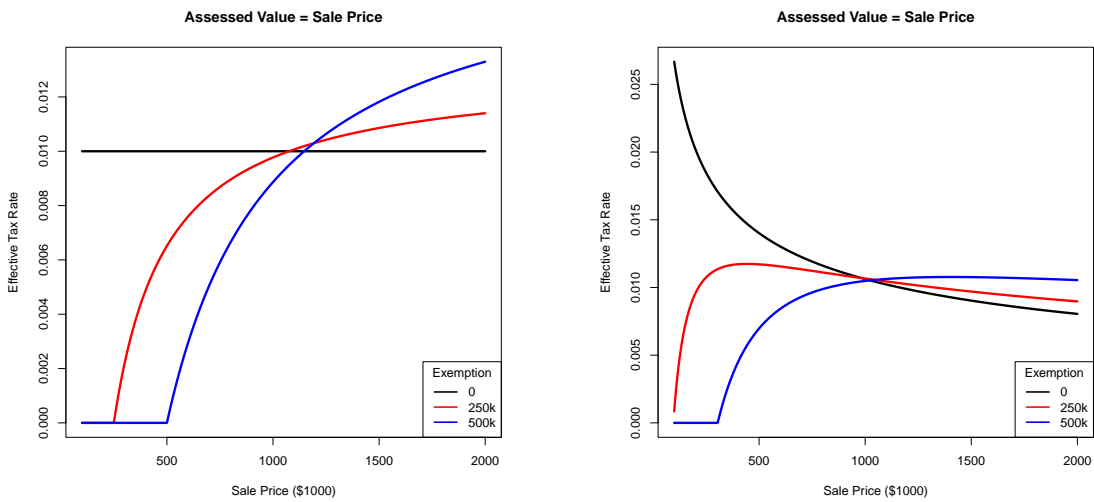
<sup>2</sup>Other methods for measuring regressivity are discussed in [McMillen and Singh \(2021\)](#), who conclude that commonly used regression-based measures are biased toward a finding of regressivity.

**Figure 1: Using Simulated Data**

Panel A: Log Assessed Values and Assessment Ratios



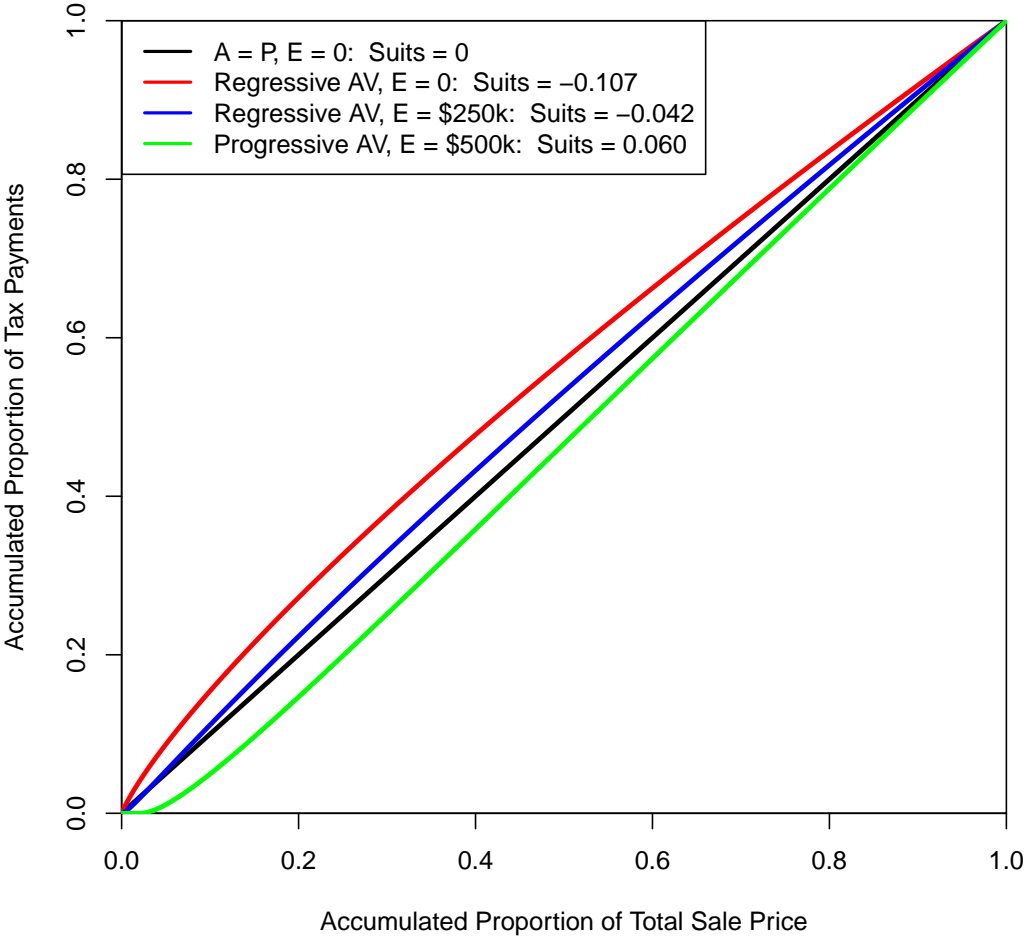
Panel B: Effective Tax Rate



of assessments. The Suits index is developed from a modified Lorenz curve, in which the accumulated tax burden is plotted against the accumulated percent of income. To measure whether assessments are regressive, we modify the Suits Index and plot the accumulated percentage of assessed values vertically against the accumulated percentage of the sale price on the horizontal axis.

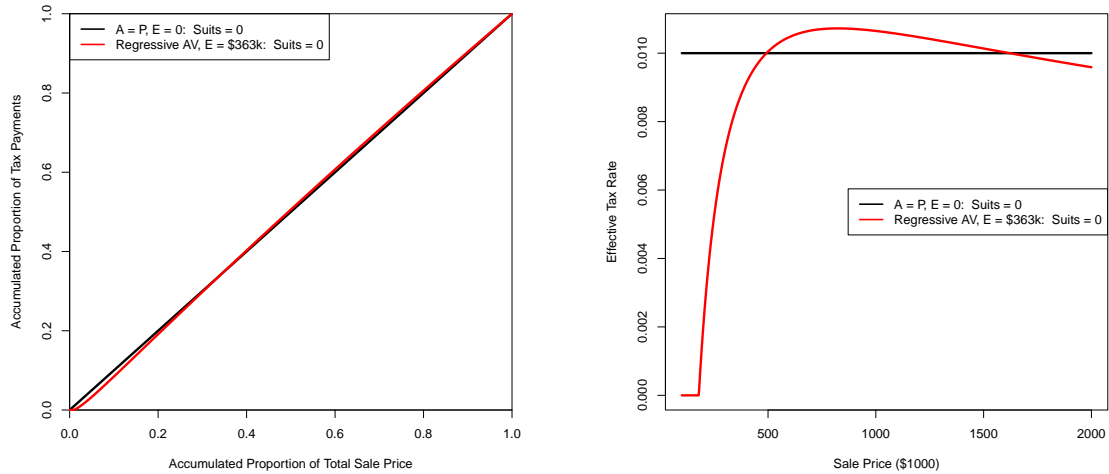
Figure 3 shows the effect of varying the homestead exemption on the Suits index. This figure illustrates the case where there is no homestead exemption, so taxes are proportional to assessed values. When assessed values are strictly proportional to sales prices, the homes whose sales prices comprise  $x\%$  of total sale price also account for  $x\%$  of total assessed value. Thus, the black, 45-degree line diagonal represents the curve for proportional assessments (i.e., neither regressive nor progressive). If assessments are regressive, homes whose sales prices account for  $x\%$  of total sale price account for more than  $x\%$  of total assessed values, leading to a curve lying above the diagonal line, as is the case for the red line in Figure 3. Using  $K$  to represent the area under the black line in Figure 3 and  $L$  for the area under the red line, the Suits index is defined as  $1 - L/K$ . Negative values of the index imply that assessment regressivity leads to regressive taxes, positive values imply tax progressivity, and a value of zero implies that taxes are proportional to the sale price. When assessments are regressive, and there is no exemption, the curve (in red) lies above the black, 45-degree line and the value of the Suits index is negative (-0.107). A modest exemption of \$250k produces the blue line, which is closer to the 45-degree, but for which the value of -0.042 for the Suits index implies that taxes are still regressive. An exemption of \$500k produces a progressive tax structure: the green line lies below the 45-degree line and the value of the Suits index is 0.060.

Figure 2: The Suits Index





**Figure 3:** Homestead Exemption and Effective Tax Rate with Suits=0



The value of the exemption that produces neither tax regressivity nor progressivity is the value that leads to a Suits index of zero. All that is necessary to calculate this value is to vary the value of  $E$ . For this simulated data set, this value of exemption, which makes the Suit index equal to 0, is  $E = \$363k$ . Figure 3 shows the relationship between the accumulated proportions of the sale price and tax payments for this value of the homestead exemption. Since some homeowners with property values below  $363k/\text{median}(A/P) = \$393k$  pay no tax when they claim the exemption, the red line initially lies below the 45-degree line. To gain the same amount of revenue as the case where assessed values are proportional to the sale price, owners of high-priced homes have to pay higher taxes than they would when  $E = 0$ , which causes the red line to lie above the 45-degree line in Figure 3. The right panel of Figure 3 shows that the implied tax structure is highly progressive at low sales prices, although the high degree of assessment regressivity produces some tax regressivity at high sales prices.

### 3 Data

We use two data sources to calculate values of the homestead exemption that eliminate assessment regressivity. The first is a detailed data set for Cook County, Illinois. Cook County is interesting in part because it has been singled out as a jurisdiction with highly regressive assessment practices (e.g., [Avenancio-León and Howard \(2022\)](#); [Berry \(2021\)](#))

The county currently has approximately 5.2 million residents and 1.6 million residential properties. Our data set was provided by the Illinois Department of Revenue, which conducts annual studies comparing sales prices to assessments for all counties in Illinois to analyze the accuracy of the assessments. An advantage of our data set is its long time frame, 1980 - 2022. Each sale is paired with the property's assessed value from the year prior to the sale.

Another major advantage of working with a single jurisdiction is it allows us to take into account its institutional structure, some of which is unique to Cook County. The institutional structure of property assessment varies markedly across the country, and often within states and even within counties. From 1960 to 1986, Cook County was divided into four assessment districts ([The Civic Federation, 1997](#)), each of which was reassessed every four years on a rotating basis. By 1990, the county was realigned into three districts – Chicago, the North Suburbs, and the South Suburbs. From 1987 - 1989 the townships were reassessed at various times to make the transition to the new three-year assessment cycle. Since then, the new assessment years for Chicago have been in three-year intervals from 1991 to 2021. Knowing this cycle allows us to determine the origin date of the assessments. We use a repeat sales price index to adjust nominal sales prices to their value at the time of assessment.

Cook County has a classified assessment system, which allows assessment rates to differ for small residential properties (6 units or fewer), larger residential properties, and other classes. Other major classes include vacant land, commercial, industrial, and various special classes. Statutory assessment rates have varied over time, declining from 22% for small residential properties from 1974 - 1975 to 21% in 1976 to 16% for 1977 - 2008 and to 10% since then. Tax rates are constrained to be the same for all property classes, but differences in assessment rates lead to lower statutory effective tax rates for residential properties than for other classes. We restrict the analysis to Class 2 properties, i.e., small residential properties.

Our second data source, CoreLogic, provides data on assessments and sales prices for the entire country. There are significant problems with commercially provided data sets that are often overlooked in the literature. It is not always clear when assessed values originated, and data on property classes and deeds are not always coded accurately.<sup>3</sup>

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<sup>3</sup>Although data on land uses and deeds are also sometimes coded incorrectly in our Cook County data

It also is not feasible to determine statutory assessment rates, classification status, and exemptions in place for all the jurisdictions in the country. Nonetheless, the data set allows us to calculate a stylized tax schedule for multiple municipalities in the country.<sup>4</sup>

For the CoreLogic data set, we restrict the analysis to sales of single-family homes. The tax year for which data on assessments are available ranges from 2006 - 2018, most of which are from 2015 - 2017. We restrict the sample to sales that took place within two years of the tax year. As we do not have price indices for all municipalities and do not have information on the origination date of the assessments, we cannot adjust sales prices to the assessment origination date. After restricting the data set to municipalities with at least 100 sales, our final sample includes 9,091 municipalities.<sup>5</sup>

## 4 Cook County

The Cook County data set includes 2,098,999 sales of properties from 1980 - 2022. Given the assessment cycle, the years of origin for the assessed values range from 1976 - 2021. All sales are drawn from the Illinois Department of Revenue database. Sales prices are adjusted to the origination date of the assessments using a repeat sales price index calculated using the DOR data.

The left panel of Figure A.1 shows the evolution of the median assessment ratio over time. The dashed line shows the statutory assessment rate for small residential properties. Median assessment ratios generally drifted downward over time and have consistently been lower than the statutory assessment rate, except for a brief time during the Great Recession when assessments failed to keep up with the rapid decline in sales prices. The right panel of Figure A.1 shows the values for the coefficient of dispersion (COD), which is the measure of variability that is traditionally used in assessment ratio studies.<sup>6</sup> The

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set, it has the advantage that the recorded information is the same that is available to the assessor.

<sup>4</sup>We use the municipality as the unit of observation rather than geographic units such as counties or census tracts because they are likely to be closer to the units used in practice in states that allow small jurisdictions to conduct assessments. There is significant variation across the states in the geographic unit for which assessments are conducted. For example, assessments are conducted by municipality in Massachusetts and Connecticut, by county in Pennsylvania, and by township in most of Illinois.

<sup>5</sup>For both data sets, we use the available data to restrict the sample to arm's length sales of non-foreclosed properties. We use a nonparametric trimming procedure [International Association of Assessing Officers \(2017\)](#) to exclude properties with assessment ratios that are indicated to be outliers.

<sup>6</sup>The coefficient of dispersion measures the average absolute percentage difference between actual assessment ratios and the median value for the year. IAAO standards call for CODs below 15% for residential properties ([International Association of Assessing Officers, 2017](#)).

values of the COD generally exceed IAAO standards for variability, and were especially high during the 1991 and the Great Recession.

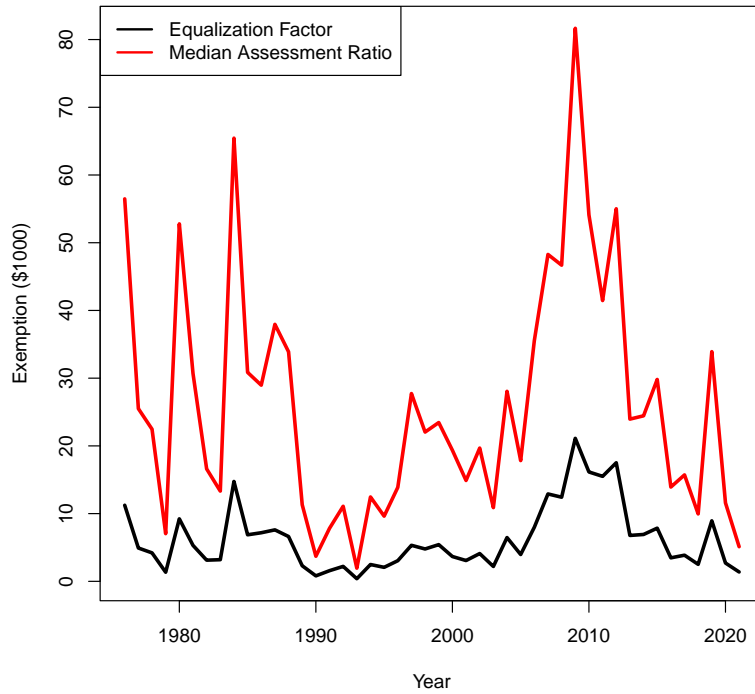
Figure A.2 shows the price-related differentials for each year since 1976. Although there have been times when the PRD has met the IAAO standard, assessments generally have been regressive in Cook County. Regressivity was especially severe in the 1980s and again during the Great Recession.

What level of exemption would eliminate the regressivity displayed in Figure A.2? We use two approaches to address this issue. First, we use an approach that takes explicit account of the unique nature of the property tax system in Illinois. Since the Illinois constitution requires properties to be assessed at 1/3 of market value within a jurisdiction, while Cook County’s statutory rates have always been lower than 1/3 for residential properties, assessments in Cook County must be raised by an “equalization factor” to adjust nominal assessment rates to this level. Denoting this equalization factor by  $e$ , the tax payment for a homeowner claiming the homestead exemption is  $T = t \max(0, erP - E)$ , where  $r$  is the assessment ratio and  $A = rP$ . The second approach adjusts the assessed values up to market value using the median assessment ratio for the year, i.e.,  $T = t \max(0, rP/\text{median}(r) - E)$ . Since median assessment ratios are always lower than 1/3 for small residential properties, the second approach always produces a higher value for the exemption.

The equalization factors, as shown in Figure A.3, have increased over time because the median assessment ratios have been steadily declining over this time, as shown in the left panel of Figure A.1. Figure 4 shows the exemptions that are needed to eliminate the regressivity in the taxes implied by each year’s assessed values if all homeowners claim the exemption. To put these values in perspective, the homestead exemption was \$10,000 in Cook County in 2021. Since this exemption is applicable to the case where the tax is calculated using the year’s equalization factor, it is directly comparable to our method 1. Assessments were not highly regressive in 2021: the PRD was only 1.015 and the Suits index was -0.009. Thus, the actual exemption level more than compensated for the degree of regressivity in assessments. Even in 2009, which was the year with the highest degree of assessment regressivity, the exemptions required to eliminate the implied tax regressivity are not outlandish: \$21,114 by method 1 and \$81,661 by method 2.

**Figure 4: Cook County: Exemptions**

Panel A: Exemptions using Equalization Factor and Median Assessment Ratio



Panel B: Comparison of Non-Regressive Exemption to Actual Average Exemption

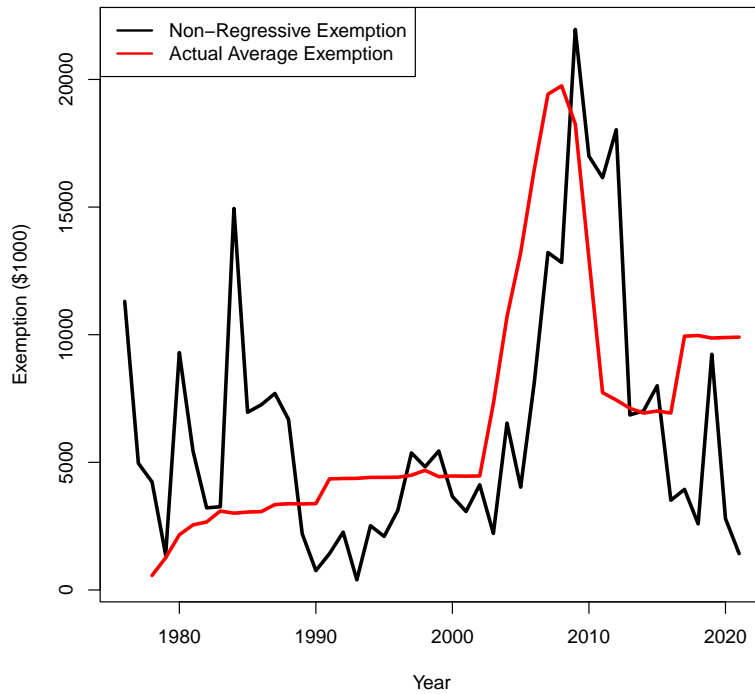


Figure 4 compares our calculations of the exemptions required to produce non-regressive property taxes with the actual average exemptions claimed by homeowners in Cook County.<sup>7</sup> The average exemption rose significantly from 2004 - 2010 due to the enactment of an “alternative general homestead exemption”, which allowed homeowners to claim an additional exemption if the rate of growth in their assessed value exceeded 7% across reassessment years (Dye et al. (2006)). The alternative exemption was phased in 2003 and was eventually sunsetted in 2012, although it no longer applied to many homeowners due to the rapid decline in property values from 2009 - 2012. Figure 4 suggests that the actual average general homestead exemption is in line with the amount required to eliminate the tax regressivity induced by assessment regressivity.

## 5 National Data

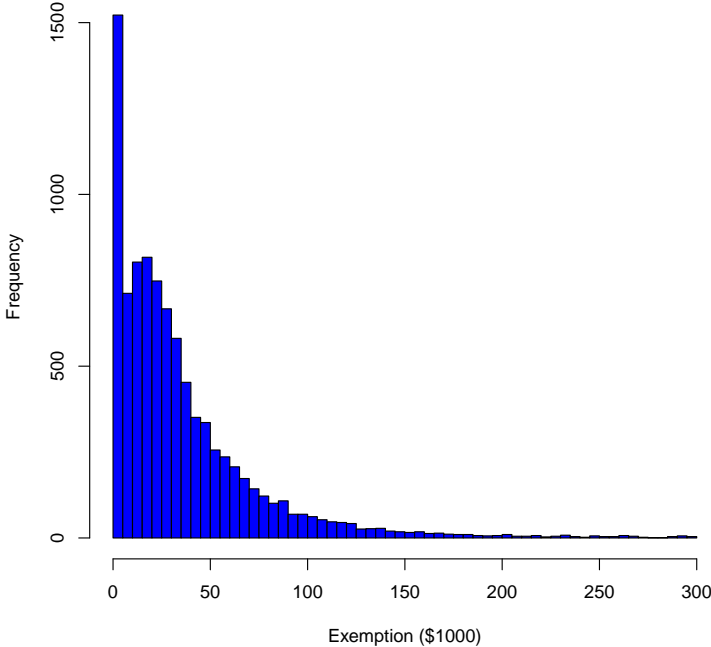
The CoreLogic data allows us to calculate assessment ratios for 9,091 municipalities in the US for various tax years. Median assessment rates are shown in Figure B.1. Clearly, a large number of jurisdictions require properties to be assessed at market value, but the histogram has peaks at rates below 1.0 also. Figure B.2 shows the coefficients of dispersion. The median value of the COD is 17.51, and 62.8% of the municipalities have CODs exceeding the IAAO standard of 15.0 for excessive variability.

Figure B.3 shows the distribution for the PRD values. The median value is 1.029, and nearly half (48.0%) of the municipalities have values that exceed the IAAO standard of 1.03 for regressivity. The vast majority (92.3%) have values greater than 1.0, implying some degree of regressivity. Figure 5 shows the exemptions that are required to eliminate the tax regressivity implied by the regressivity of assessed values. Assessed values are adjusted to market values by dividing by the median assessment ratio, and all homeowners are assumed to claim the exemption. 10.5% of the municipalities do not require an exemption to eliminate regressivity because they have non-negative values of the Suits index. The median value of the exemption is \$24,639.

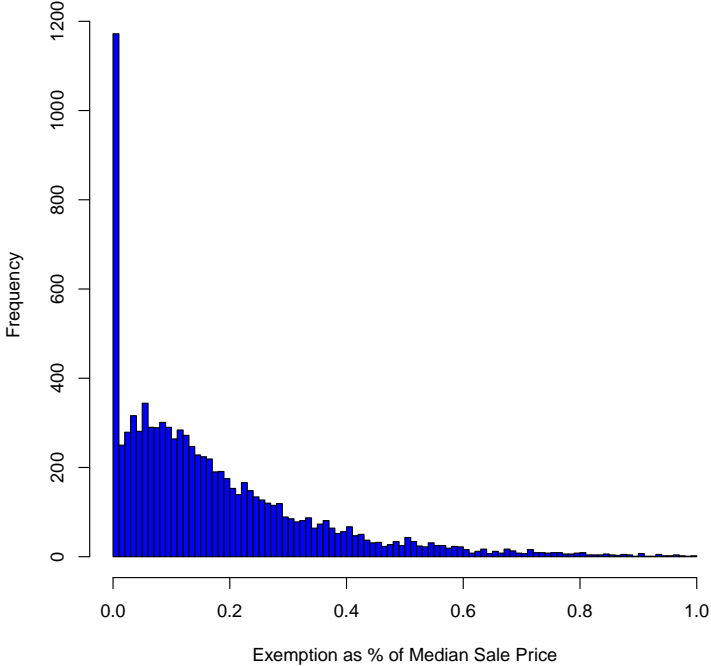
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<sup>7</sup>The average annual exemption is calculated from various issues of the Illinois Department of Revenue publication, *Property Tax Statistics*, which reports the total number of general homestead exemptions claimed and the total reduction in the “equalized assessed valuation” (EAV). This average compares directly to our Method 1 because  $EAV = eA$ , i.e., the equalization factor times the actual assessed value.

**Figure 5:** National Data: Exemptions



**Exemption as % of Median Sale Price**



To put these values in perspective, Figure 5 shows the distribution of exemptions as

a proportion of the municipality’s median sale price. The median percentage is 12.7%, and 93.6% of the municipalities have exemptions that are less than half of the median sale price. Thus, relatively moderate values of the homestead exemption are sufficient to eliminate the regressivity produced by regressive assessment practices.

## 6 Conclusion

By statute, the property tax is progressive in jurisdictions with a homestead exemption when progressivity is defined as a higher effective tax rate for higher-priced homes. However, the long-standing tendency toward assessment regressivity reverses this progressivity in many jurisdictions. Using CoreLogic data for 9,021 municipalities, we find that roughly half of the municipalities have degrees of assessment regressivity that exceed IAAO standards, and more than 90% have some degree of regressivity in assessments.

We provide estimates of the size of the homestead exemption that is required to eliminate the regressivity of the property tax that is associated with assessment regressivity. We find that moderate exemptions can eliminate this regressivity: the median exemption is \$24,639, or about 12.7% of the median sale price. Our results are based on the assumption that all owners of residential property take the exemption, including owners who are investors or who do not use the home as their primary residence. It is important to note that required exemptions can also help determine the degree of regressivity. In other words, the higher the necessary exemption to offset the regressivity, the greater the regressivity in assessments.

We also present a detailed analysis of assessments in Chicago for assessment years ranging from 1976 - 2021. The degree of regressivity varies markedly over time, sometimes being insignificant while at other times being extreme. The extreme times are during recessions, and are due in part to Cook County’s 3-year assessment cycle, which causes assessments to remain unchanged for a third of the county even as prices decline. The homestead exemption significantly moderates the degree of regressivity induced by recessions and by not having annual reassessment.

Our analysis focuses exclusively on regressivity associated with regressive assessment practices. Even if assessment regressivity is eliminated, the property tax could still be regressive when regressivity is defined with respect to income rather than home prices.



This pattern would occur if lower-income households spend a higher proportion of their income on housing than high-income households. This pattern of regressivity could be addressed by providing income-related exemptions. Moreover, assessment regressivity can be reduced by increasing the accuracy of assessment across sales prices. The significance of our results is to establish that moderate homestead exemptions can eliminate assessment-induced regressivity in property taxes.

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## A Chicago Data

**Figure A.1:** Cook County: Median Assessment Ratios and Coefficients of Dispersion

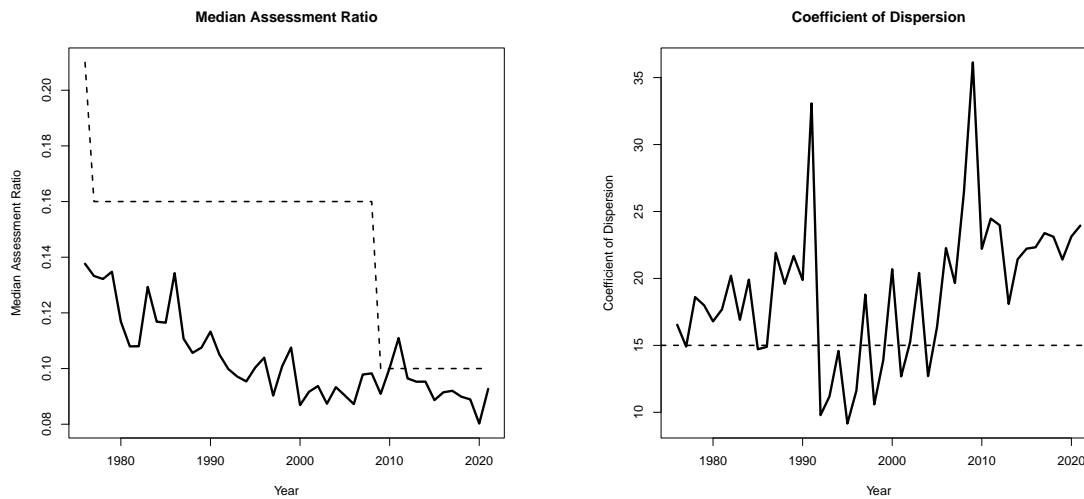


Figure A.2: Cook County: Price-Related Differentials

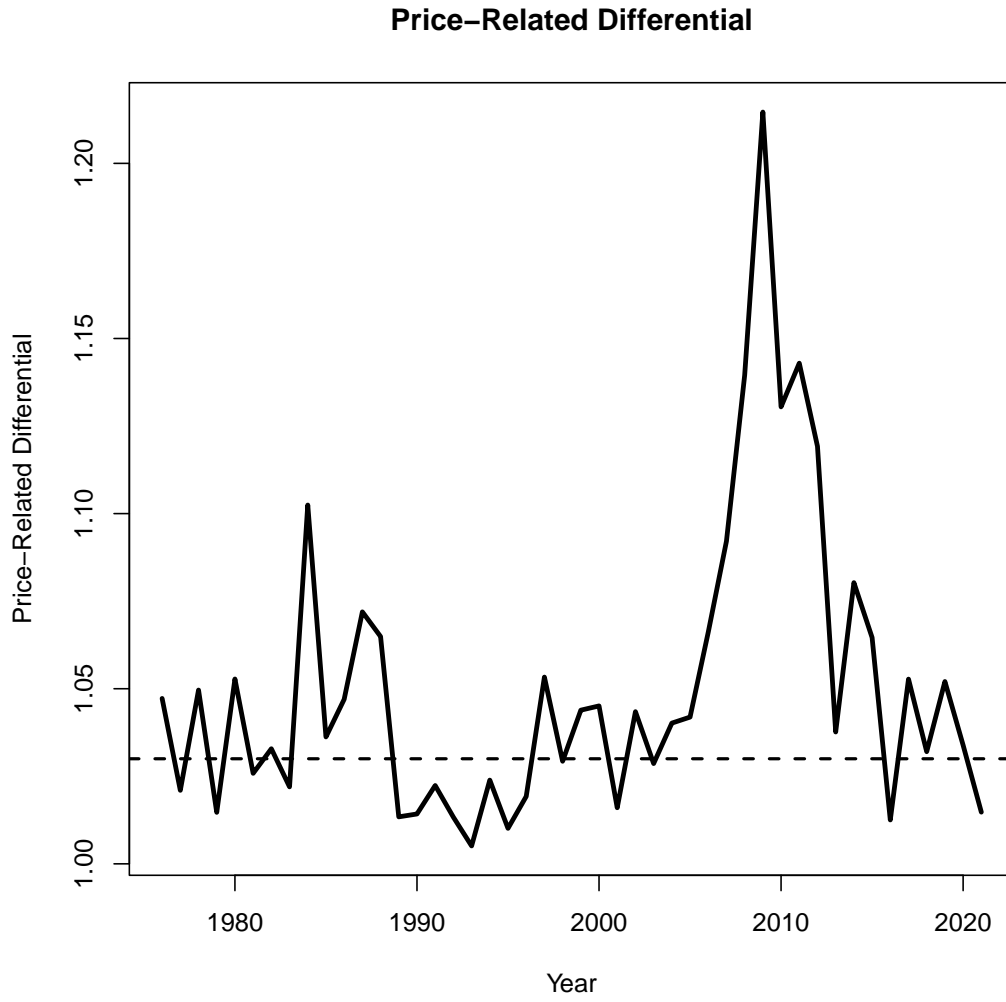


Figure A.3: Cook County: Equalization Factors



## B National Data

Figure B.1: Median Assessment Rates

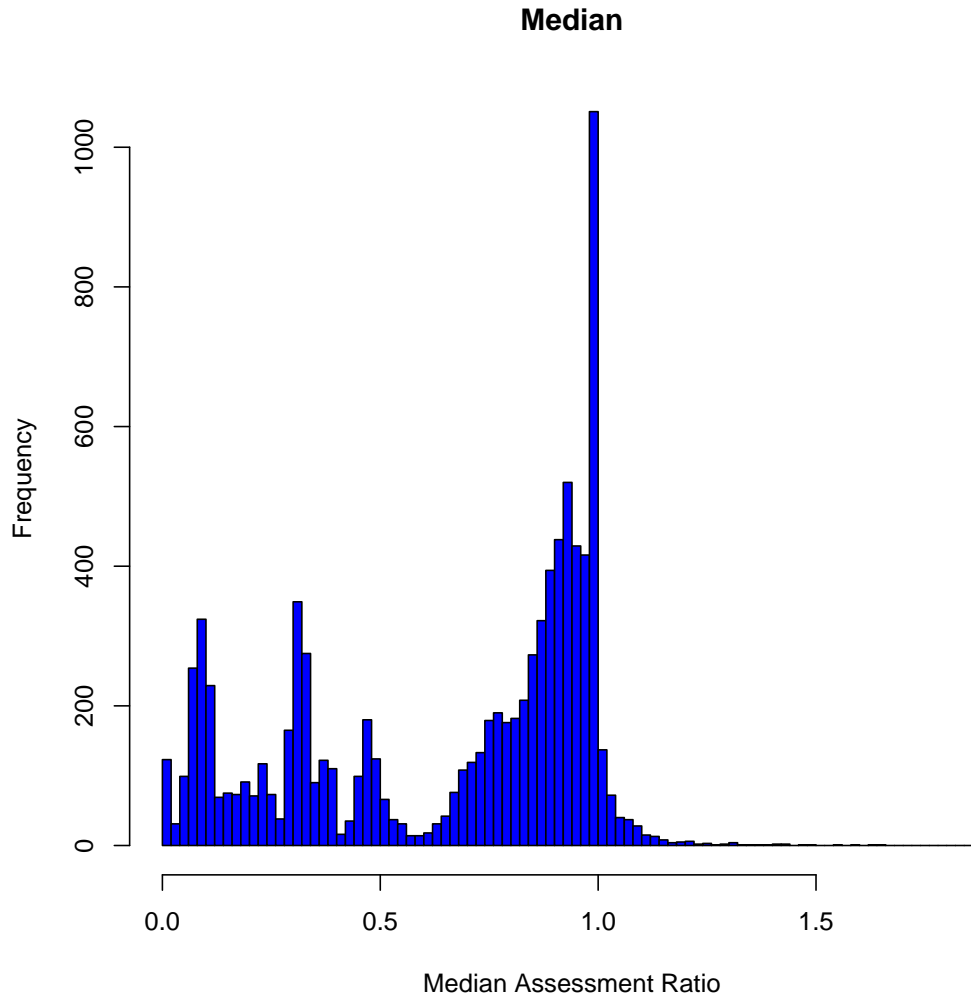
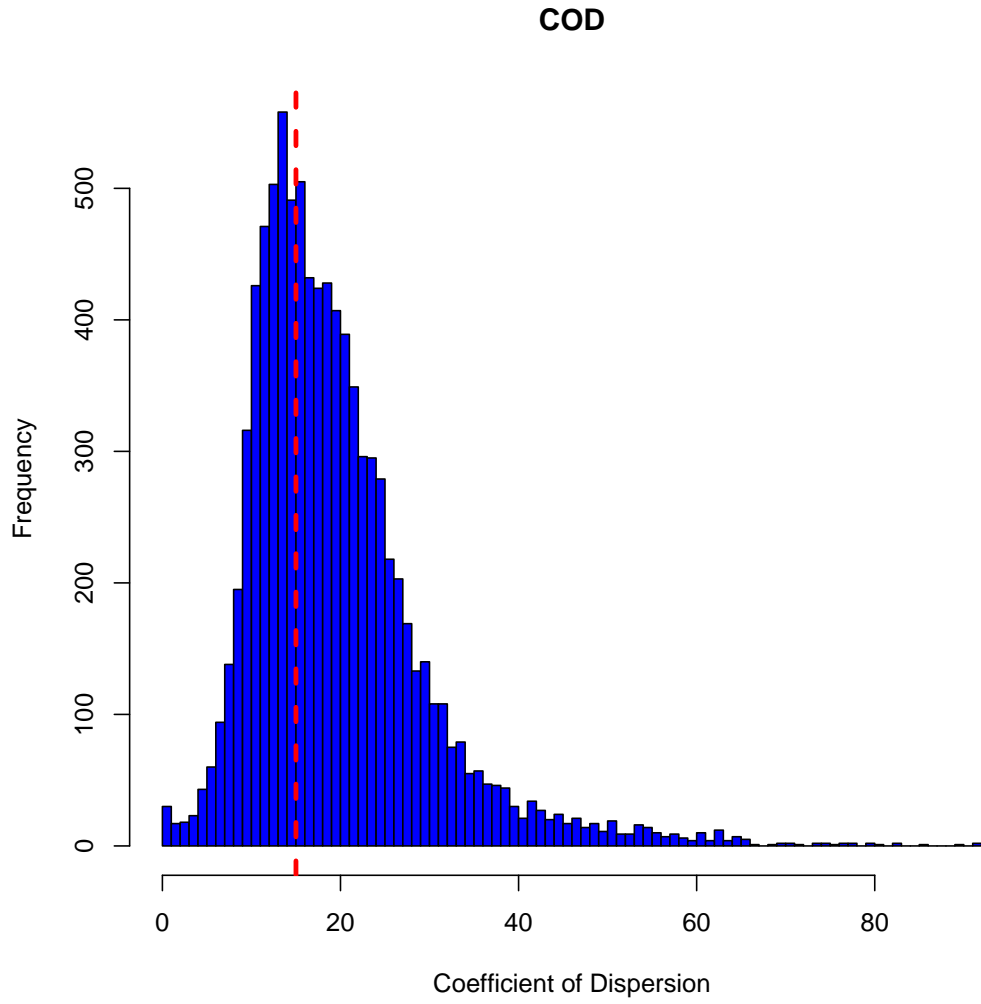


Figure B.2: Coefficients of Dispersion





**Figure B.3:** Price-Related Differential

