

## 2. A price index for residential property in Göteborg, 1875–2010\*

Jan Bohlin

### 2.1. Introduction

Historical time series on residential property prices are rare. The longest we know of covers the Heerengracht district in Amsterdam<sup>1</sup> in the period 1628–1973. Eitrheim and Erlandsen<sup>2</sup> have constructed residential property price indexes for four Norwegian cities (Oslo, Bergen, Trondheim, and Kristiansand), as well as a weighted index for Norway based on these cities, for the period 1829–2003. Well known is also Robert Shiller's work on historical price data<sup>3</sup> for the US since 1890.

For Sweden, the official statistical agency, SCB, has collected price data for residential properties since 1952.<sup>4</sup> From 1952 onwards, data on the average sales price appraisal ratio<sup>5</sup>, i.e. the ratio between the sales price and the appraised taxation value, were published in the periodical *Statistisk Tidskrift*, and thereafter in *Statistiska Meddelanden* and *Statistisk Årsbok*.<sup>6</sup> They are based on certificates of registration of ownership titles (*lagfartsbevis*); atypical observations, such as sales between close relatives and by executive auction, were excluded, since they might not reflect competitive market prices.

SCB's data contain information on the number of sales, average sales prices and

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\* Kristoffer Collin has provided excellent research assistance in collecting archival data for this chapter.

1 Eichholtz (1997).

2 Eitrheim and Erlandsen (2003); Eitrheim and Erlandsen (2005).

3 Shiller (2000).

4 Residential property is divided here into two groups: apartment buildings (Swedish *hyreshus*) and houses (Swedish *småhus*, *1- och 2-familjhus*, *radhus*, etc.).

5 In Swedish, *köpeskillingskoefficienten*. The term Sales Price Appraisal Ratio is adapted from Bourrassas et al. (2006).

6 Hammarberg (1958); *Statistisk tidskrift* 1959–1962; *Statistiska meddelanden* R, 1963–1968; *Statistiska Meddelanden* P, 1969–; *Statistisk Årsbok* 1970–.

the sales price appraisal ratio. The data are presented separately for densely and sparsely populated areas, as well as for individual counties and regions. Moreover, the same data are presented separately for one-family houses, two-family houses, leisure houses and apartment buildings. The data are commonly also given for separate classes of appraised taxation values.

Based on sales price appraisal ratios, SCB has constructed a price index for residential properties, commencing in 1975.<sup>7</sup> For the period 1952–1974, Bo Sandelin has presented price data collected by SCB. Based on these data, he constructed price indexes for residential properties for 1952–1956<sup>8</sup> and 1957–1974.<sup>9</sup> Since Sandelin did not have any reliable data on the typical change in appraised taxation values between 1952 and 1957 as a result of the general appraisal of taxation values in 1957, he did not estimate the price change from 1956 to 1957.

The data provided by Sandelin and SCB can be used to construct price indexes for residential properties for the entire period from 1952 onwards. As SCB has not presented any such price data for the period before 1952, we need to collect archival data. In this paper we present a new price index for Göteborg for the period 1875–1952 based on such data.

## 2.2. A price index for residential property in Göteborg, 1875–1957

### 2.2.1. Background: population growth and residential construction in Göteborg from the mid-19th to the mid-20th century

Göteborg is Sweden's second largest city. Traditionally it has been Sweden's most important port for the importation and exportation of goods. Göteborg was, and still is, also the site for some of Sweden's most important export industries, such as shipbuilding (closed down in the late 1970s), the ball-bearing manufacturer SKF and the car manufacturer Volvo. Another important feature of industrialization and industrial growth in Göteborg in the late 19th century and the inter-war period was the growth of home-market oriented industries such as textiles and garments and food processing. The rapid growth of industries in Göteborg from the late 19th century onwards was naturally closely connected with rapid population growth.<sup>10</sup>

The population of Göteborg, defined as the administrative boundaries of 1974, grew from slightly more than 25,000 inhabitants in the mid-19th century to about

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7 SCB's method for constructing house price indexes on the basis of the sales price appraisal ratio is discussed in section 2.2 below.

8 For the period 1952–1956 Sandelin also presents a separate index for apartment buildings (*hyreshus* in Swedish).

9 Sandelin (1977).

10 The following paragraphs are deeply indebted to Fritz (1996, Ch. II), and Olsson (1996, Ch. III).



Map of Göteborg from 1888.

Source: Wikipedia.

370,000 a century later.<sup>11</sup> Net migration was the major factor initially but from the late 1880s until the early 1920s natural population growth contributed slightly more than net migration, which broadly varied with the business cycle. Population growth led to an increased demand for housing and thus an increase in residential construction.

Until the mid-19th century, settlement was concentrated to what today is the inner core of central Göteborg, inside the moats, although there were also working-class lodgings, mainly wooden houses, in Majorna and Haga. Inside the moats, residential properties were mainly built in stone or brick following the city's reconstruction after a fire in the beginning of the 19th century.

Expansion outside the moats began in the late 19th century. Stone buildings were erected in Vasastaden, Heden and Lorensberg, which today are part of central Göteborg. New apartment buildings were also erected in the typical working-class neighbourhoods, Majorna, Masthugget, Haga, Landala, and Annedal in central and western Göteborg. Initially, they were mainly two-storey wooden buildings. Taller wooden buildings were banned at first because of the perceived risk of fire. In order to make better use of the ground, contractors then started to build three-storey buildings, the ground floor in stone and the upper two storeys in wood. Buildings of this type, known as "county governor houses" (*landshövdingehus*) after the county administrative board had permitted them,<sup>12</sup> are typical for Göteborg. They still dominate the townscape in neighbourhoods such as Majorna and Olskroken, in western and eastern Göteborg, respectively.

In the inter-war period, population growth was again dominated by net migra-

<sup>11</sup> Fritz (1996, p. 24); Olsson (1996, p. 51).

<sup>12</sup> Fritz (1996, p. 45).

tion. As before, this was closely connected with business cycles. To accommodate the growing population, construction of new residential buildings expanded geographically. This was facilitated by the development of a tram network, making it possible to live in one part of the city and work in another.<sup>13</sup> In the 1920s many new residential buildings were constructed in neighbourhoods such as Kungsladugård, Bagaregården, Änggården and Kålltorp; “county governor houses” were the characteristic type in the former two, while a new type of owner-occupied one- and two-family house began to appear in Änggården and Kålltorp. Expansion continued in Kungsladugård and Änggården in the 1930s, accompanied by many new residential stone buildings in Johanneberg on the outskirts of south-central Göteborg. Residential construction also expanded in northern and north-eastern Göteborg in neighbourhoods such as Lundby, and Lunden; in the 1940s also in Guldheden, south of Johanneberg (Olsson 1996, pp. 68–72).<sup>14</sup>

In many respects, the end of World War II and the early 1950s ushered in a new era in the history of residential construction in Göteborg. The size of dwellings and their material standard were much better than those of the inter-war period. In many former working-class neighbourhoods, such as Masthugget and Annedal, old buildings were demolished in favour of modern housing. In the 1960s, residential construction spread to new suburbs.

### 2.2.2. *Methods*

The construction of a price index for residential property raises numerous methodological problems. If the sample of properties that were bought and sold each year was uniform in terms of size and quality, it might be conceivable to base price indexes on the yearly average or the yearly median sales price. This is generally not the case, however. Residential properties that are sold and bought vary in quality, size, geographical location etc. The quality of a given property may change over time as a result of renovation and depreciation. Moreover, as a given residential property tends to be sold infrequently, the number of sales per property is small. In order to compare prices of heterogeneous objects they must obviously be related to some common standard.

One way of accounting for price differences between properties in a given period is to use hedonic price regressions, where prices are regressed on variables that indicate quality differences between properties.<sup>15</sup> However, data on such quality indicators are difficult to obtain for long historical periods.

In the international literature, the most common way of constructing price indexes for residential properties on the basis of historical data stretching far back in

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13 Olsson (1996, pp. 53–55).

14 Olsson (1996, pp. 68–72).

15 Kain and Quigley (1970).

time is the “repeated sales method”.<sup>16</sup> Using repeated price quotations for the same property yields price comparisons that pertain to reasonably homogeneous objects, although it does not evade the problem with quality changes. With such price comparisons it is possible to construct a comprehensive price index by means of regression analysis. The price change for property  $i$  between period  $t-n$  and period  $t$  may be written:

$$\frac{P_{i,t}}{P_{i,t-n}} = b_t / b_{t-n} * e_{i,t} \quad (1)$$

where  $b_t$  stands for the non-observed price index value in year  $t$ , and  $e_{i,t}$  is the error term. Equation (1) may be transformed into logarithmic form:

$$\log\left(\frac{P_{i,t}}{P_{i,t-n}}\right) = -\log b_{t-n} + \log b_t + \log e_{i,t} \quad (2)$$

In order to estimate the non-observed price index values, dummy variables are created and set to  $-1$  for the first and  $1$  for the last time period in a pair of sales. For each pair of sales, the dummies in all other time periods are set to zero. Estimates for  $b_t$  are obtained by regressing the logarithmic price ratios against all time dummies.

The price index series is obtained after taking the antilogarithm of the estimated coefficients. Setting the series to unity in the base year normalizes the resulting index series.<sup>17</sup>

The repeated sales regression as stated in (2) does not contain an intercept. Goetzmann and Spiegel<sup>18</sup> argue, however, that an intercept is useful because it captures improvements, which typically occur before properties are offered for sale and are independent of the length of the interval between the purchase of a property and its subsequent sale. Moreover, the longer the interval between purchase and sale, the greater presumably is the likelihood of quality and other changes that affect the price. We would therefore expect a larger variance in price ratios for observations with a long interval between sales. Case and Shiller<sup>19</sup> therefore propose a three-step procedure to refine the method developed by Bailey et al. The first step is to run a regression according to the method of Bailey et al.; in the second, the squared residuals from this regression are then regressed against a constant and the time intervals between the sales that make up the price ratios; in the third step the log price ratios and the time dummies of the first step regression are transformed by dividing them by the square roots of the predicted values from the second step regression, after which the regression is re-estimated.

A problem with the repeated sales method is that it disregards many observations,

16 See for example Eitrheim and Erlandsen (2003); Eitrheim and Erlandsen (2005) and Eichholtz (1997).

17 Bailey et al. (1963).

18 Goetzman and Spiegel (1995).

19 Case and Shiller (1989).

since properties with only one recorded sale are not used in the construction of a price index. Another problem is that properties which come to market repeatedly might be poorer in quality than those which are sold more seldom.<sup>20</sup> Methods that combine repeated sales and hedonic price regressions have been developed to circumvent these problems.<sup>21</sup> But again, such methods are difficult to apply to historical price data because variables indicating quality differences between residential properties are usually not available.

To construct price indexes for residential properties, Statistics Sweden (*Statistiska Centralbyrån, SCB*) uses, as already mentioned, the sales price appraisal ratio method, in which the sales price of a property is divided by the property's appraised taxation value.<sup>22</sup> Taxation values are commonly unchanged for some years pending the setting of new values in a general reassessment.<sup>23</sup> Dividing the sales price in a given year by the taxation value yields an estimate of the extent to which prices have changed since the base year to which the taxation appraisal values refer.

Index numbers based on sales price appraisal ratios may be calculated as equal-weighted or value-weighted averages.<sup>24</sup> The equal-weighted version of the index is calculated as:

$$I_{Et} = \left\{ \left[ \sum_{j=1}^{n_t} (S_{jt} / A_{j0}) / n_t \right] / \left[ \sum_{j=1}^{n_{t-1}} (S_{jt-1} / A_{j0}) / n_{t-1} \right] \right\} I_{Et-1} \quad (3)$$

where  $I_{Et}$  is the equal-weight index for period  $t$ ,  $S_{jt}$  is the sales price for property  $j$  in period  $t$  and  $A_{j0}$  is the corresponding appraised taxation value at the time of appraisal. The value-weighted index is calculated according to the formula:

$$I_{Vt} = \left\{ \left[ \sum_{j=1}^{n_t} S_{jt} / \sum_{j=1}^{n_t} A_{j0} \right] / \left[ \sum_{j=1}^{n_{t-1}} S_{jt-1} / \sum_{j=1}^{n_{t-1}} A_{j0} \right] \right\} I_{Vt-1} \quad (4)$$

In the value-weighted index, properties with higher prices get more weight than in the equal-weighted index. Consequently, if sales price appraisal ratios in higher priced properties differ from those in properties with lower prices, the two formulas will yield different index numbers. As argued by Bourassas et al.,<sup>25</sup> the equal-weighted index is preferable if we want to know how prices have developed for the typical or

20 Quigley (1995; Eichholtz (1997).

21 Case and Quigley (1991); Quigley (1995); Carter Hill et al. (1997); Englund et al. (1998).

22 This method is also used in New Zealand and Denmark, see Bourassas et al. (2006).

23 For specific properties, appraised taxation values could also be adjusted during a period of otherwise stable taxation appraisal values if the property underwent major changes.

24 Bourassas et al. (2006).

25 Bourassas et al. (2006).



*Linen market at Drottningtorget in Göteborg 1907.*

Source: Göteborg City Museum.

average property bought and sold, whereas the value-weighted index is a measure of the price evolution of the housing stock. The price index for residential properties in Göteborg, 1875–1957, presented below, has been calculated according to the equal-weighted index formula.

The basic idea behind the sales price appraisal ratio method is that the ratio between sales prices and taxation values is similar for different types of residential property. The taxation value of a residential property should reflect the market price an informed buyer would typically pay at the time of the appraisal. Supposedly it should thus take into account various kinds of quality differences between residential properties. In that case the evolution of the average sales price appraisal ratio indicates the price movement of residential properties as long as taxation values are unchanged. However, as general reassessments of taxation values occurred every two to five years or so, these values do change periodically. Therefore, in order to construct a price index series for a longer period we obviously also need an estimate of how much appraised taxation values typically changed from period to period.

The sales price appraisal ratio method compares favourably with other methods for constructing price indexes for residential properties.<sup>26</sup> A desirable characteristic of such a price index is that it takes quality changes into account so that it measures the evolution of prices for residential properties with a constant quality. Since the tax

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<sup>26</sup> Bourassas et al. (2006).



*Västra Hamngatan in central Göteborg in 1905.*

Source: Göteborg City Museum.

authorities' reassessments of properties ideally take quality changes into account, the sales price appraisal ratio method allows for changes in quality. Index constructions based on repeated sales may be more biased in that the quality of a property may change between sales, especially if there is a long interval between two sales.

### 2.2.3. Sources

In order to construct a price index for residential properties in the city of Göteborg in the period 1875–1957 we have used archival sources. Registration of property ownership was regulated in an ordinance in 1875. Local governments were required to keep ledgers of properties (*fastighetsböcker*) that recorded each legal event concerning a specific property, such as registration of ownership titles (*lagfartsbevis*) and mortgages. This source, which is geographically ordered, does not contain information on sales prices and taxation values but provides pointers to other sources of such information. Of special interest to us is a source (*lagfartsprotokoll*) that is ordered chronologically and contains registration of ownership titles. For the period 1875–1939 we have used this source to collect information on property prices and taxation



values.<sup>27</sup> We have only recorded transactions that involve sales which may be assumed to reflect market prices. Accordingly, we have not included transactions involving exchanges of properties, transactions between close relatives or sales by executive auction. We planned to collect about 100 observations for each year but this could not be achieved because our sources had too few recorded transactions that met our requirements. In addition to sales prices and taxation values, we recorded the dates of sales and ownership registration as well as the names of the recorded properties.<sup>28</sup> The latter makes it possible to identify repeated sales of the same property.

The source containing chronologically ordered registrations of ownership titles (*lagfartsprotokoll*) ends in 1939. From that year onwards we have used a source that is geographically ordered in the same way as the ledgers of properties.<sup>29</sup> For each property it contains information on taxation values and sales prices if a sale of that property occurred, which was by no means always the case. This source is more laborious to work with, since in order to secure a sufficient number of observations annually one has to peruse the records of quite a number of properties, many of which were not sold.

All in all we have recorded 6,883 observations of sales transactions for Göteborg in 1874–1957. The observations are not limited to a specific district or neighbourhood, but contain information from all over Göteborg. Since the settlement of Göteborg expanded geographically over time, the geographical spread of our observations also extends over time and the types of residential property become more varied. We have calculated sales price appraisal ratios for all those observations for which information on both sales prices and taxation values were available. In most cases, sales and legal registration of ownership pertain to the same year. In cases where the sources do not record the sales date, we simply assume that sales and legal registration pertain to the same year. Given this assumption, sales and legal registration pertain to the same year in roughly two-thirds of our sample. But it is also quite common for the legal registration of a property to occur in the year after the sales transaction, or even later. For example, if a sale occurred in the late autumn it might have been legally registered in the beginning of the following year. The difference between the registration year and the sales year was greater than one in about 8 per cent of the cases. If a new general taxation of properties, with new appraisals of taxation values, did not take place between the date of sale and the date of registration, we have assumed that the taxation value given in the *lagfartsprotokoll* is correct. However, if there had been a new

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27 Göteborgs landsarkiv, Göteborgs Rådhusrätt och magistrat 1:a avdelningen före år 1900: A II a, Lagfartsprotokoll; Göteborgs Rådhusrätt och magistrat första avdelningen efter 1901: A II aa, Lagfartsprotokoll 1901–1939.

28 These are given by the district (*rote*) and/or quarter (*kvarter*) and within that district/quarter by the number of the plot of land.

29 Göteborgs Rådhusrätt och magistrat första avdelningen efter 1901: A II ad. Inskrivningsakter 1940–1967.

general reassessment, we cannot be sure that the taxation values in the *lagfartsprotokoll* did not change between the year of sale and the year of registration. In these cases we have looked up the taxation values pertaining to the year of sale in another source, *Göteborgs adress- och industrikalender*, which for each year contains a register of all residential properties along with their taxation values.

In a few cases, the calculation of sales price appraisal ratios yielded extreme values. They may be due to clerical errors but the most likely reason is that the property is unrepresentative, for example because the building had been extended or otherwise changed. When calculating average sales price appraisal ratios for a given year, we have generally excluded observations if sales price appraisal ratios are smaller than 0.5 or larger than 3. We have furthermore deleted observations where sales price appraisal ratios differ from the mean in the given year by more than roughly four standard deviations. This has left us with a total of 6,352 observations to calculate average sales price appraisal ratios for the period 1875–1957, see Table A2.2 below.

Appraised taxation values were adjusted from time to time in order to allow for changes in sales prices in the preceding period. General reassessments of taxation values were made at intervals of roughly three or five years.<sup>30</sup> In order to use sales price appraisal ratios to construct a residential property price index for the entire period 1875–1957, we need to estimate the average change in taxation values from one general reassessment of taxation values to the next. The source we have used for this, “Address and Industry Calendar of Göteborg” (*Göteborgs adress- och industrikalender*), was published annually from 1850 until 1947. It contains taxation values for each and every registered property in Göteborg. For the period 1875–1947 we have sampled roughly 200 to 350 properties, which we follow over time in order to estimate changes in appraised taxation values. We have extended the sample over time in order to allow for the increased geographical coverage of the sample frame. Changes in the arrangement and listing of properties in *Göteborgs adress- och industrikalender* have led us to use different samples for the periods 1875–1924 and 1925–1947. For the period after 1947 we have used another printed source, *GBG-boken*, which contains the same information on taxation values of properties. Since the arrangement and listing of properties in this source differ from *Göteborgs adress- och industrikalender*, 1925–1947, we have used another sample of properties for 1952–1953.

From our data we infer that changes in appraised taxation values took place in 1876, 1879, 1882, 1884, 1887, 1890, 1893, 1896, 1898, 1903, 1908, 1913, 1918, 1922, 1928, 1933, 1938, 1945 and 1952. Our estimates of the average change in taxation values for these years are given in Table A2.1. When calculating these average changes we have deleted extreme observations, defined as a change from one period to the next that deviates from the mean by roughly more than three standard deviations.

In calculating sales appraisal ratios we have used sales prices and taxation values

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30 In each year, assessments of taxation values were also done for specific properties, for example for newly constructed buildings or existing buildings that had been extensively changed.

recorded in the *lagfartsprotokoll*. This source is chronologically ordered with new entries each week. The taxation values given in this source pertain to the date of registration; they might have changed later during the year following a general reassessment, when new taxation values were set. From our data we infer that new general taxation values were set late in the autumn. Consequently, in years of general reassessment of taxation values the bulk of our data refer to the taxation values that were valid before the reassessment at the end of the year. In our construction of residential property price index numbers we have therefore generally assumed that, following a general reassessment of taxation values, the new values were implemented the following year. This may lead to a slight error in the price index since if the sale of a property took place late in the year, the *lagfartsprotokoll* might record the new taxation value.

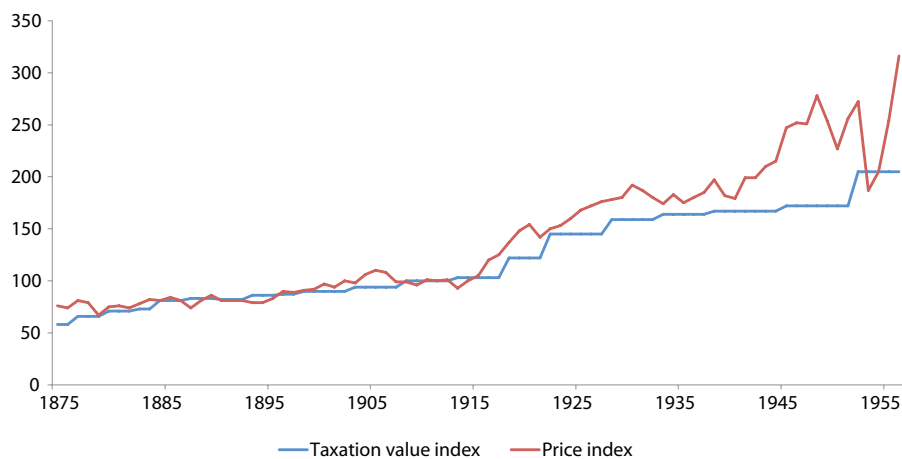
#### 2.2.4. The evolution of prices for residential properties in Göteborg, 1875–1957

##### 2.2.4.1. Price index calculated by the sales price appraisal ratio method

Table A2.2 presents our estimates of average yearly sales price appraisal ratios for Göteborg along with an index of average taxation values. We use the latter to multiply the average sales price appraisal ratios in order to obtain an index series of prices for residential properties. As can be seen from Figure 2.1, prices and taxation values developed more or less in tandem from 1875 until the interwar period, after which prices tended to rise faster than taxation values. Over the entire period 1875–1957, residential property prices rose by 1.7 per cent per annum. However, the price rise was not uniform over time. In Figure 2.1 one can distinguish several distinct periods in the evolution of residential property prices in Göteborg. These prices were pretty much unchanged from 1875 to 1895 and then rose at an annual rate of 3 per cent in the next eleven years, 1895–1906. This was followed by a price decline of 2 per cent a year in the period 1906–1914. During the First World War and its aftermath, 1914–1921, residential property prices in Göteborg rose by 7.5 per cent a year and then fell by roughly 8 per cent during the deflation in 1921–1922. In the rest of the 1920s and up to 1931, residential property prices rose by more than 3 per cent per annum, after which they fell again by slightly more than 3 per cent a year during the depression, from 1931 to 1934. From 1934 to 1939, prices recovered at an annual rate of 2.6 per cent and went on rising at an annual rate of 3.5 per cent in the following decade, from 1939 to 1949. Prices fell again from 1949 to 1954, after which they recovered.

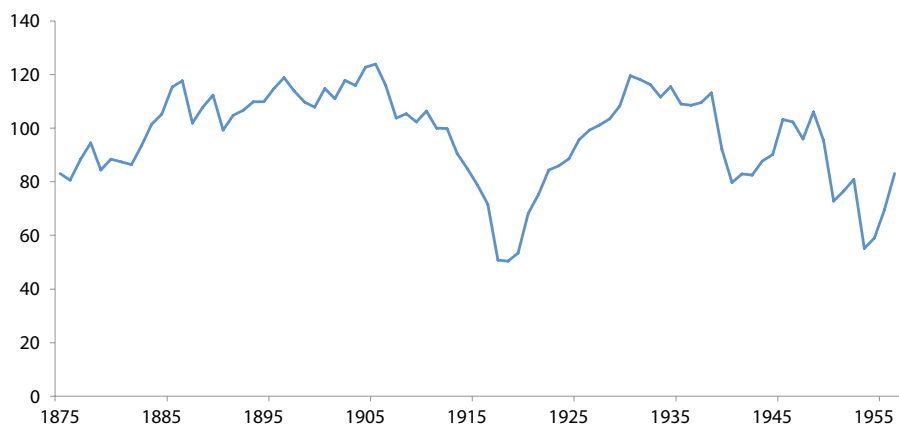
This evolution of nominal residential property prices in Göteborg is very different from the picture of real prices, i.e. nominal prices deflated by a consumer goods price index, as can be seen in Figure 2.2. Disregarding annual fluctuations, real prices for residential properties rose at an annual rate of 1.3 per cent in the period 1875–1906 and then fell back at a rate of –7.2 per cent from 1906 until 1918, with a particularly

**Figure 2.1.** Price index and taxation value index for residential property, Göteborg 1875–1957 (1912=100)



Sources. See Table A2.2.

**Figure 2.2.** Real price index for residential property in Göteborg, 1875–1957 (1912=100)



Sources: Nominal prices, see Table A2.2; consumer price index, Edvinsson and Söderberg (2010).

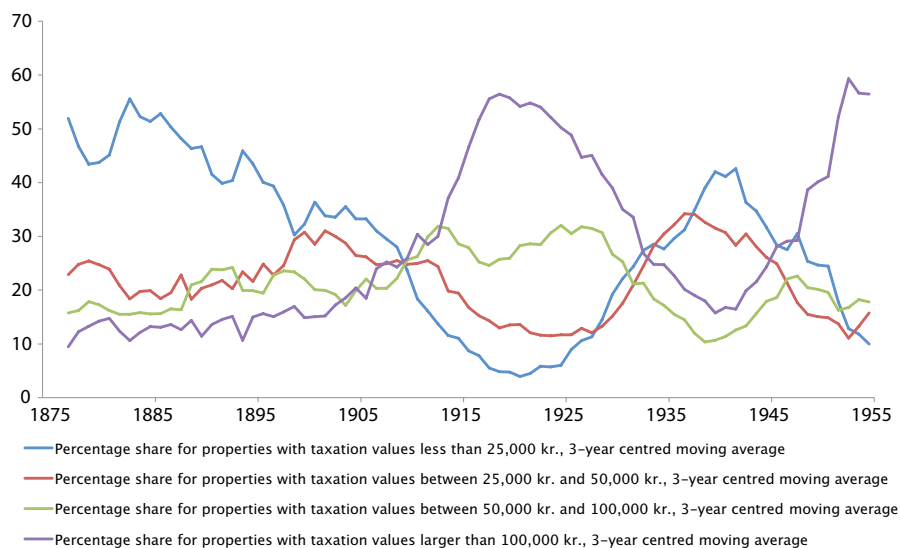
sharp drop during the First World War. In other words, residential property prices rose much less than prices for consumer goods during the wartime inflation. After the war, when consumer prices declined in the deflation of the 1920s and early 1930s, nominal prices for residential properties either rose or declined less, so real prices for residential properties rose at an annual rate of almost 6 per cent between 1918 and 1933. In the rest of the 1930s, real property prices tended to fall and then dropped more steeply between 1939 and 1941, after which they recovered in the rest of the 1940s.

### 2.2.4.2. Changing composition of residential properties and the sales price appraisal ratio index series

The data we have assembled may be regarded as a convenience sample, since we have used all the data we could assemble given the resources at our disposal. As a result, in our sample, the proportion of residential properties in different price ranges varies between time periods, as shown by Figure 2.3.

As the general level of residential property prices rose, many properties shifted from a lower to a higher price range. Accordingly, the proportion of properties in our sample that sold for less than 25,000 kronor declined from the late 19th century up to the First World War and the proportion in the upper price ranges increased. However, there also seem to be compositional changes between time periods in our sample of properties that cannot be explained by the evolution of the overall level of property prices. During the First World War, the annual average price of properties in our sample increased much more than the overall level of prices as measured by our price index. This was due to a disproportionate increase in these years in the share of properties that sold for more than 100,000 kr. The proportion in this price range in our sample is also larger in the 1950s. In the inter-war period, on the other hand, the average price in our sample fell even though the general level of residential property prices rose, because in these years the proportion in the lowest price ranges grew. A probable explanation for this is the extension of the geographical areas from which our properties are sampled. Properties outside downtown Göteborg were generally smaller. For example, in neighbourhoods such as Änggården the new properties consisted primarily of owner-occupied one- and two-family houses.

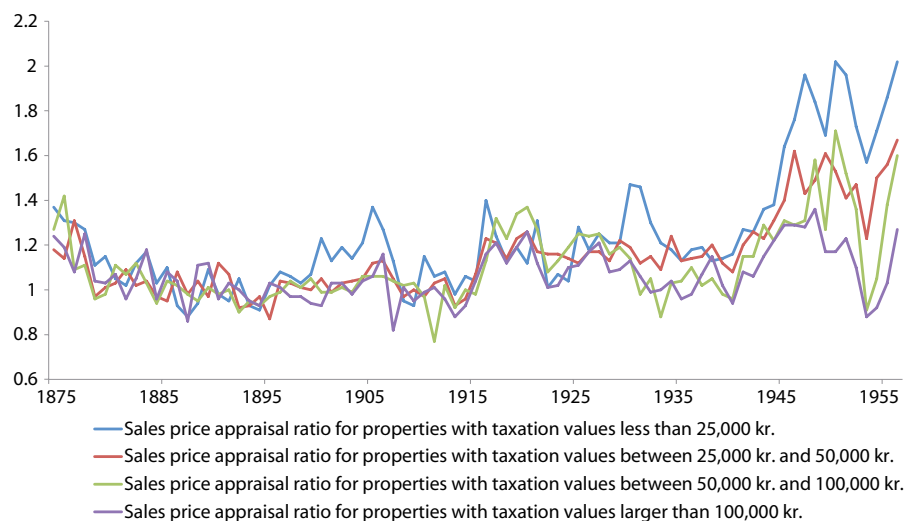
**Figure 2.3.** *Proportion of residential properties in different taxation classes, centred moving five-year averages, 1875–1957*



Sources: See Table A2.2.

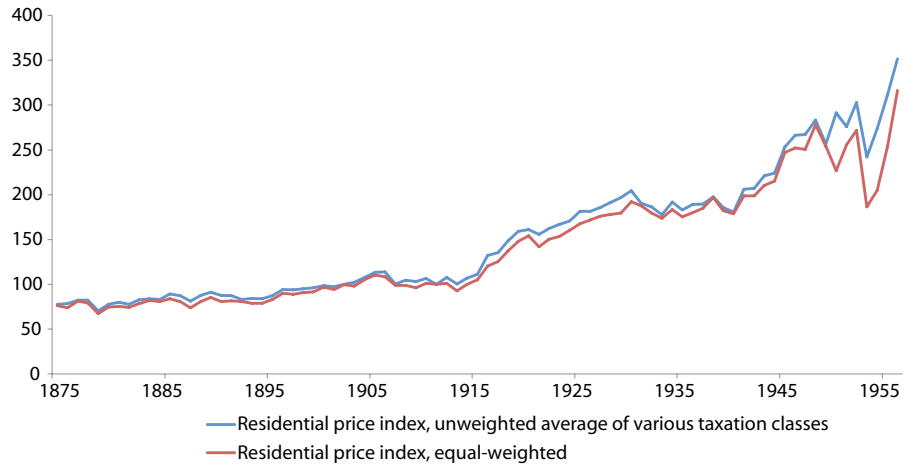
Does the change between periods in the composition of types of residential property affect our estimated price index? It might if the evolution of the sales price appraisal ratio differed between the various price ranges. The sales price appraisal ratio was often higher in the lower price ranges, as shown by Figure 2.4. However, what matters most for the overall price index is the rate at which sales price appraisal ratios changed in the various price ranges. To get an idea of the extent to which a changing composition of properties in the various price ranges affects our estimated overall price index, Figure 2.5 presents our equal-weighted overall sales price appraisal ratio index together with an average of the sales price appraisal ratio index series for the different ranges of taxation values depicted in Figure 2.3. In the latter, the weights of the various taxation classes in the overall index are always the same, whereas in the former the composition of taxation classes varies over time. As can be seen, there is a difference between the series but it is small before the 1950s. Prices for properties in the upper price ranges rose more slowly than in the lower price ranges. Consequently, the larger proportion of properties in the upper price ranges tends to lower our equal-weighted index for the 1950s.

**Figure 2.4.** Sales price appraisal ratios for residential properties in different taxation classes, 1875–1957



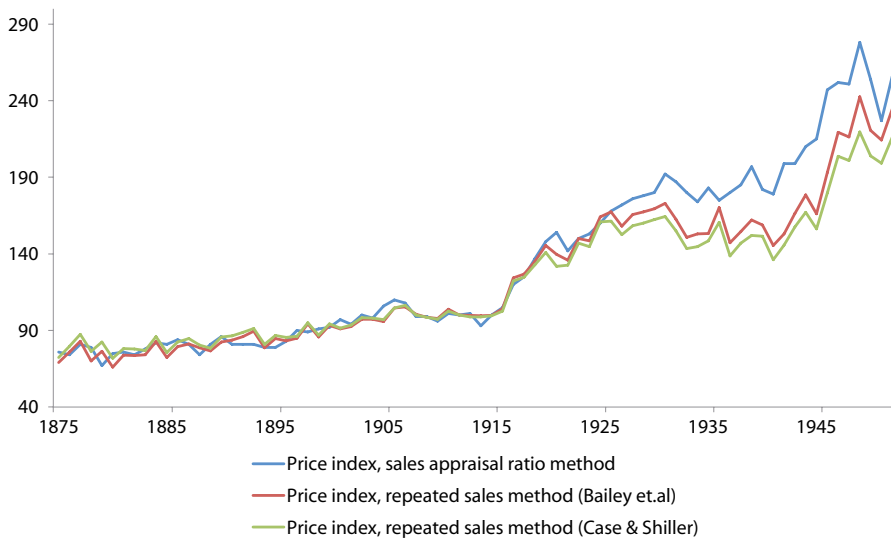
Sources: See Table A2.2.

**Figure 2.5.** Price indexes for residential properties in Göteborg (1957=100), equal-weighted index and unweighted average of equal-weighted indexes for different taxation classes, 1875–1957.



Sources: See Table A2.2.

**Figure 2.6.** Price indexes for residential properties in Göteborg 1875–1952 (1912=100), calculated by different methods.



Sources: See Tables A2.2 and A2.3.



*A view of Göteborg from the Liseberg amusement park.*

Source: Wikipedia.



*Bangatan in Majorna, Göteborg, in the mid-1930s.*

Source: Göteborg City Museum.



In conclusion, the changing composition of the types of property included in the sample has some effects on the price index series. However, the overall picture does not seem to be greatly affected by compositional changes, at least before the 1950s.

#### **2.2.4.3. Price index series calculated by the repeated sales method**

Since our database includes information on the name of each property, it has been possible to identify repeated sales of the same property. Slightly more than 3,000 of the observations were repeated sales, containing sales data on roughly 1,400 properties. Since this dataset is based on identifying properties built on a particular piece of land, there is obviously room for mistakes in identifying repeated sales. It may, for example, be the case that a building had undergone extensive changes or that an entirely new building had been erected on the same piece of land between two sales, especially if many years passed between the sales. In order to minimize this risk and get rid of otherwise extreme observations, we excluded a pair of sales from the dataset if the sales price appraisal ratio is larger than 3 or smaller than 0.5. Furthermore, we excluded a pair of sales if the change in the taxation value between them was more than a three-fold increase or more than a 50 per cent decrease. Observations where the interval between two sales was longer than 25 years have also been excluded from the repeated sales dataset.

Two price index series calculated by the repeated sales regression method are presented in Table A2.3. The first is calculated according to the original method of Bailey et al., the other according to the modification of this method proposed by Case and Shiller.<sup>31</sup> For both series we have included an intercept in the regressions. The two series are displayed in Figure 2.6 together with the series calculated according to the sales price appraisal ratio method. First we may note that the general contour of development is similar in all three series. A difference between the series is that the price rise is slightly faster up to the First World War according to the two repeated sales series, after which the sales price appraisal ratio series catches up with them. In the 1930s, prices are more or less unchanged according to the index calculated by means of the sales price appraisal ratio method, while they decline according to the repeated sales series because of a larger fall in 1931–1933. This seems to be a sample issue, since calculating sales price appraisal ratios on the repeated sales sub-sample gives approximately the same fall in these years as in the series calculated according to the method of Bailey et al.

Another difference is that the repeated sales series gives more pronounced year-to-year fluctuations, especially from the late 1920s onwards, which may be related to the limited size of the sample used to estimate the repeated sales regressions. But it also has to do with methodological differences; the sales price appraisal ratio method yields less volatility even when calculated on the same sub-sample.

The series calculated according to Case and Shiller's method tracks the series calculated by means of the Bailey et al. method closely until the 1930s, although the

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<sup>31</sup> Bailey et al. (1963); Case and Shiller (1989).

former method generally yields slightly lower index values. This difference widens in the 1930s and 1940s, which indicates that the intervals between sales that make up the log price ratios in the sample become longer over time.

Using different methods to calculate the price index numbers serves as a check on the series' validity. The similarity of the results, even though the series are calculated on different samples, is reassuring. We prefer the series calculated by the sales price appraisal ratio method since it is based on a larger sample. As argued by Bourassas et al.,<sup>32</sup> it should also be preferred for methodological reasons.

#### 2.2.4.4. A comparison of the residential property price index for Göteborg with similar series for Norwegian cities

Norway is one of the few countries for which we have long historical price series for residential properties. It is interesting to compare the new series for Göteborg with similar series for cities in neighbouring Norway, in its own right as well as to check the validity of the new Göteborg series. Figure 2.7 presents our preferred price index for Göteborg along with price indexes for Norway's two largest cities (Oslo and Bergen) and an index for four Norwegian cities. As can be seen, the time profile of the Göteborg series is similar to the Norwegian series, especially the one for Oslo, but there are also some differences. First, during the First World War, residential property prices in Norwegian cities increased faster than in Göteborg, which can at least partially be explained by the somewhat higher rate of inflation in Norway. Secondly, in the 1920s, residential property prices in Göteborg rose steadily, whereas they stagnated or fell in large Norwegian cities. This seems reasonable in that post-war deflationary policies lasted longer in Norway.<sup>33</sup> Furthermore, from the early 1930s until the early 1950s, property prices rose faster in Göteborg than in large Norwegian cities except for Bergen, where their development seems to have been similar to Göteborg.

### 2.3. The evolution of residential property prices, 1957–2010

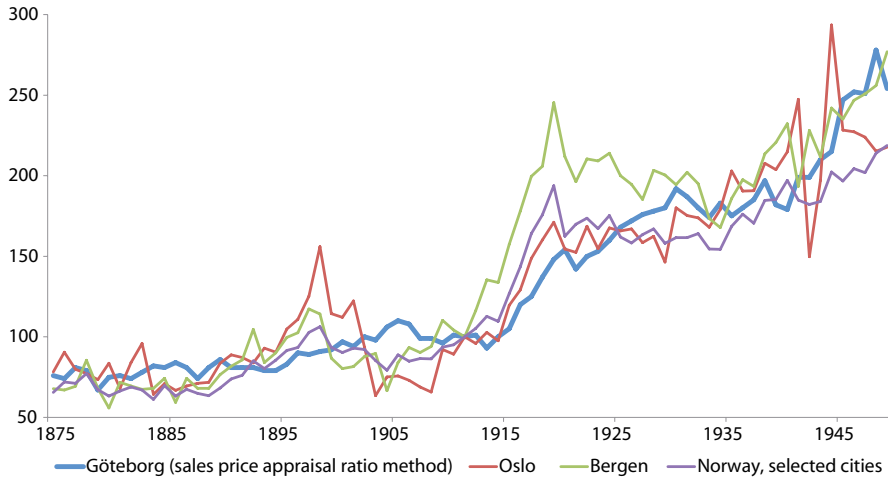
From 1975 onwards, a price index for houses in Göteborg and its suburbs (*Storgöteborg*) is available from SCB. To fill the gap in the period 1957–1975 we use data for Göteborg and Bohus county.<sup>34</sup> Unfortunately, SCB's published data cannot be used to construct a similar long-run price index series for apartment buildings in Göteborg. Data for the county of *Göteborg and Bohus* are available from 1957 to 1996 but

32 Bourassas et al. (2006).

33 Klovland (1998)

34 For the period 1957–1971, the index is constructed from the ratio of total sales value to total taxation value and is thus a value-weighted index. SCB's house price index starting in 1975 is an equal-weighted index. Thus these index series are not strictly comparable in either geographical coverage or methodology. Further explanations are given in Söderberg, Blöndal and Edvinsson (2014) of this volume.

**Figure 2.7.** Price indexes for residential properties in Göteborg and various Norwegian cities,<sup>a)</sup> 1875–1950 (1912=100).



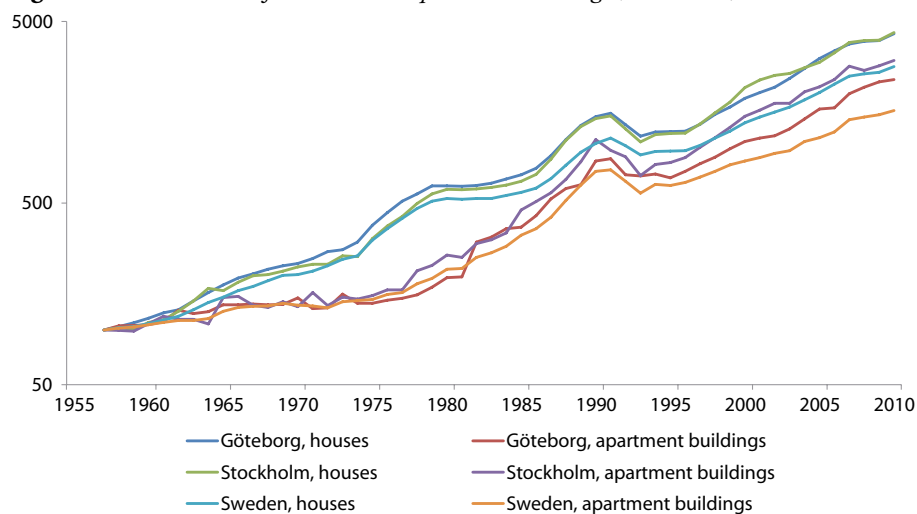
Sources: Göteborg, see Table A2.2; Norwegian series, Eitrheim and Erlandsen (2003).

<sup>a)</sup>The series “Norway, selected cities” is a weighted average of index series from Oslo, Bergen, Trondheim and Kristiansand.

due to administrative changes, from 1996 onwards SCB has published data only for the larger *Västra Götaland* region. For the period 1995–2010 we have therefore ordered hitherto unpublished data from SCB on the evolution of prices for apartment buildings in the geographical area of the former county of *Göteborg and Bohus*. This area is not exactly the same as Göteborg and its suburbs but is heavily dominated by it. For purposes of comparison, data on Stockholm and Sweden as a whole are also included in some of the figures presented below.

### 2.3.1. Residential property prices, 1957–2010

The evolution of nominal prices for residential properties in the period 1957–2010 is presented in Figure 2.8 for Göteborg, Stockholm and Sweden as a whole. The prices for houses have risen faster since the late 1950s than in the previous half-century. The rate of increase was generally higher in the big cities than in Sweden as a whole. Between 1957 and 2007, house prices in Göteborg rose at an average annual rate of roughly 7.5 per cent, while the corresponding rate for Sweden as a whole was 6.7 per cent.

**Figure 2.8.** Price indexes for houses and apartment buildings (1957=100), 1957–2010.

Sources: See Söderberg, Blöndal and Edvinsson (2014) of this volume.

The price rise for houses was fairly steady in most of this period but there were short intervals with largely unchanged prices, followed by periods with very rapid increases. From 1972 to 1979, house prices in Göteborg rose at an average annual rate of almost 13 per cent. This was followed by little or no increase up to 1986, when prices picked up again, rising at an annual rate of almost 20 per cent from 1986 to 1989. They then fell abruptly in the economic crisis in the early 1990s. In Göteborg they dropped more than 20 per cent from 1990 to 1993 or by roughly 8 per cent a year on average. Since then, house prices have risen strongly; in the period 1994–2007 the annual increase in Göteborg averaged 9 per cent.

The price indexes for houses differ greatly from those for apartment buildings in the post-war period. Prices for apartment buildings rose much less than house prices, especially in the 1960s and 1970s. In these decades the price increase for apartment buildings was not sufficient to compensate for higher inflation, so real prices for apartment buildings plummeted.

Why did prices for houses increase much more than prices for apartment buildings in the 1960s and 1970s? One obvious explanation is that rent regulation held back price increases for apartment buildings.<sup>35</sup> But, as pointed out by Sandelin and

35 Rent regulation (*hyresreglering*) was introduced in 1942 for apartment buildings in settlements with more than 2,000 inhabitants and remained in force until the mid-1970s. Rent increases had to be approved by local tribunals (*hyresnämnder*) and were allowed only as compensation for increased operating expenses or improvements to apartments. The underlying idea was that apartment rents should reflect operating costs. The norm was set by rents in local public housing utilities (*allmännyttiga bostadsföretag*), where they were based on the “use value” principle (*bruksvärdesprincipen*). See Bladh (1991, p. 273 ff.), Lindbeck (1971, p. 106 ff.)

Södersten, many other factors affected house prices in these years.<sup>36</sup> Population growth and the expansion of densely-populated communities led to an increased demand for housing. Accordingly, regions with above-average increases in population growth also had above-average increases in house prices. At the same time, rising real incomes led to stronger demand for houses, as did more widespread car ownership by facilitating commuting to work. Higher overall inflation led to lower real interest rates, making it easier for private households to finance home ownership, which also stimulated demand. Moreover, interest on loans was deductible when calculating taxable income, which further stimulated demand for houses.

Supply-side factors also played a part in the much more rapid price increase for houses compared with apartment buildings. The construction of apartment buildings expanded rapidly in the 1960s and early 1970s, not least in connection with a massive investment programme.<sup>37</sup> The construction of houses rose so much less that the per capita supply hardly changed in these years.<sup>38</sup> Moreover, lower increases in productivity meant that construction costs rose more rapidly for houses.

The 1980s is the only post-war decade in which prices for apartment buildings rose more rapidly than those for houses. Property prices rose most intensely in the late 1980s for apartment buildings as well as for commercial office buildings. The price rise was particularly intense for commercial office buildings in big cities. Many of the causes of the increase for commercial office buildings, which have been discussed in the literature, should also be relevant for apartment buildings.

An essential prerequisite for the property market's evolution in the 1980s was the deregulation of financial markets. Prices for commercial office buildings and apartment buildings were deeply depressed in the early 1980s and readily available finance made properties very attractive. Deregulation in the 1980s altered the behaviour of prospective buyers. Prior to the 1980s, properties had often been valued from a "building contractor perspective"<sup>39</sup>: the income from tenants' rents should comfortably exceed running expenses and capital costs. In the 1980s, this gave way to a more forward-looking perspective; the value of a property was now seen as being equal to the sum of future incomes from owning it, discounted to present value by a rate of interest that represented the required rate of return. It was not uncommon to add in a future rest value of the property at the end of the horizon. Applying this perspective made many properties appear to be undervalued in the first half of the 1980s, which set the stage for the rapid price rise in the decade's second half. Banks and other financial institutes considered that loans to buyers, often specialised property companies, were secure, since prices were rising rapidly for the properties which buyers could pledge. When the price rise petered out in 1990 it became apparent that many

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36 Sandelin and Södersten (1978, ch. 2–5).

37 Known as the "million programme", a reference to the Social Democratic Party's political platform in 1964, which proclaimed the need to build a million new homes in the ensuing decade.

38 Sandelin and Södersten (1978, pp. 31–32).

39 Pettersson (1993, p. 67 ff.).

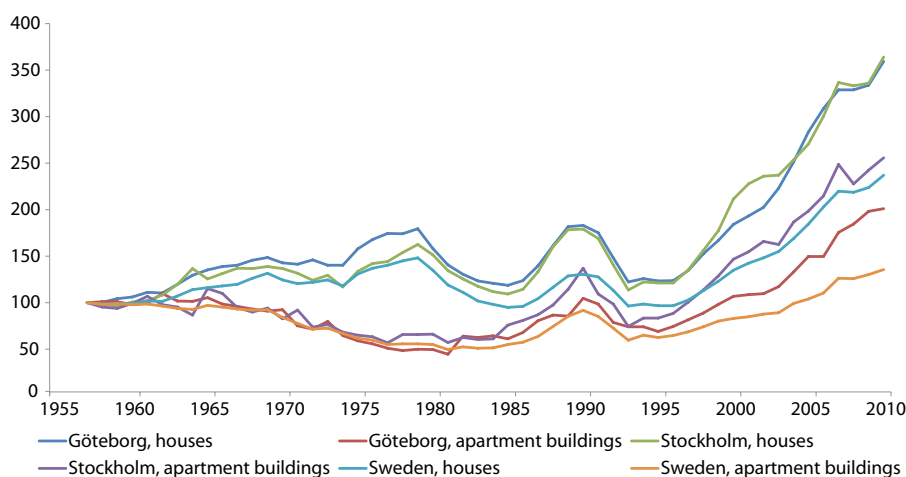
property companies were financially fragile. Prices then fell at an accelerating rate from 1990 to 1993 and many property companies could no longer service their debts. This hit the banking and financial sector and was an important ingredient in Sweden's economic crisis in the early 1990s.<sup>40</sup>

During the economic crisis, prices for apartment buildings fell to roughly the same extent as house prices. The former recovered in the mid-1990s and the increase in the next 15 years was also strong in real terms, though not as rapid as for houses.

### 2.3.2. Real prices 1957–2010

Figure 2.9 presents the evolution of real prices for residential properties in the period 1957–2010. A substantial part of the post-war increase in house prices compensated for the rise in the overall price level. In the 1960s, however, house prices rose faster than the consumer price index, so real prices increased substantially. From the 1970s to the mid-1990s, the long-run trend in real prices was flat for houses but upwards for apartment buildings, due to the depressed state of real prices for apartment buildings in the late 1970s and early 1980s. Since the mid-1990s, prices for houses as well as apartment buildings have risen considerably faster than inflation.

**Figure 2.9.** *Real price indexes for residential property, 1957–2010.*



Source: See Söderberg, Blöndal and Edvinsson (2014) of this volume.

<sup>40</sup> Pettersson (1993, ch. 3).

## 2.4. Secular evolution of residential property prices

In this section, the newly constructed price index series for residential property in Göteborg for the period 1875–1957 is linked to SCB's price data for the period 1957–2010. Owner-occupied houses were uncommon in Göteborg before the 1950s; most people lived in apartment buildings. Our newly constructed price index for Göteborg should therefore probably be linked to a price index for apartment buildings rather than to one for houses. However, data on sales prices for houses become increasingly frequent in our sample for the inter-war period, which reflects the growing number of houses in some parts of Göteborg, such as Änggården, Källtorp and Örgryte. We cannot distinguish between houses and apartment buildings in our sample but some indication of how house prices evolved compared to apartment buildings can be obtained by constructing separate price index series for properties in the lower and upper price ranges.

### 2.4.1. Prices for residential properties with low and high taxation values, 1922–1957

For the period 1922–1957 we have chosen to calculate separate price index series for residential properties with taxation values up to 75,000 SEK and above this figure. Many of the properties in the lower price range were probably small self-contained houses.<sup>41</sup> The price index series for these properties should therefore be comparable to SCB's series for houses.

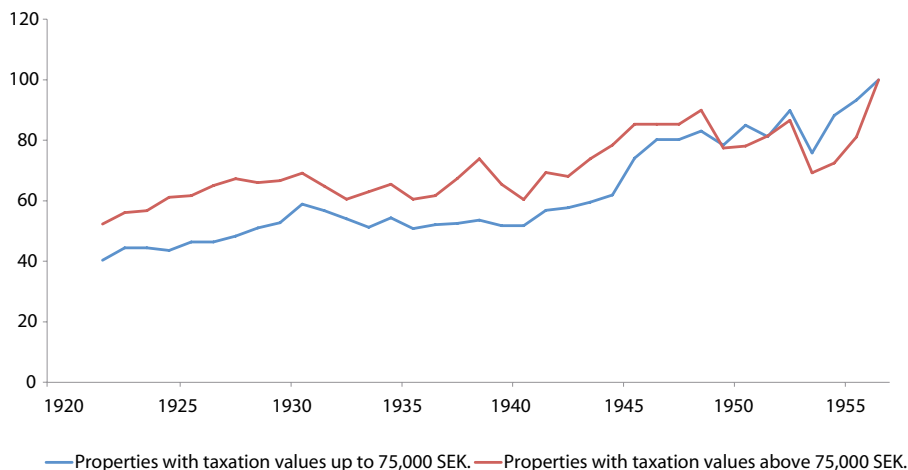
From available statistics on post-war prices for residential properties we know that prices rose faster for houses than for apartment buildings. Does this hold also for the inter-war period? As can be seen in Figure 2.10, from the late 1920s to 1931, prices for properties with taxation values up to 75,000 SEK rose somewhat faster than for those with taxation values above 75,000 SEK. Otherwise, the development of prices in the inter-war period was similar in the two price ranges. From the early 1940s, however, prices in the lower range increased much faster than those in the upper range. An obvious conclusion is that this had to do with the introduction of rent regulation in 1942; by limiting landlords' freedom to increase rents, this held back prices for apartment buildings. Small owner-occupied houses were not subject to this type of regulation and their prices, set in a free market, rose much faster than for apartment buildings.

Real prices for residential properties do not display any clear trend in the period 1922–1957. However, in the period 1941–1957, price for properties with taxation

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41 In the 1940s and early 1950s, only a few properties had taxation values above 75,000 SEK in prosperous neighbourhoods, such as Änggården and Örgryte, where owner-occupied houses were common. We have also calculated price index series for properties with taxation values up to 50,000 SEK and above 100,000 SEK, respectively. The former turned out to be similar to the series with 75,000 SEK as the upper limit, while the series for values above 100,000 SEK turned out to be similar to the one for values above 75,000 SEK.

**Figure 2.10.** Price indexes for residential properties in Göteborg with taxation values up to 75,000 SEK, and for properties with taxation values above 75,000 SEK, 1922–1957 (1957=100).



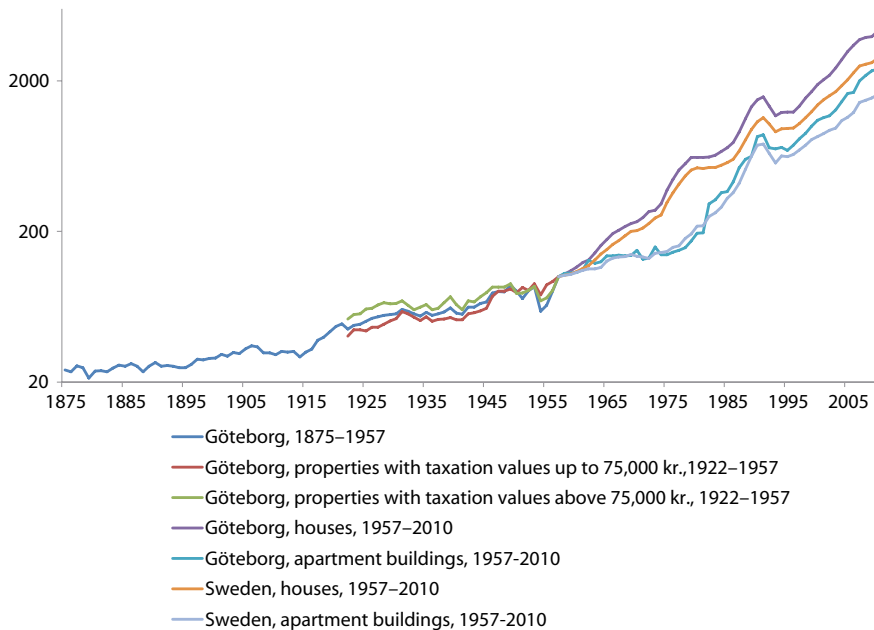
Sources: See Table A2.2.

values up to 75,000 SEK rose somewhat more than the consumer price index and increased in real terms at an average annual rate of 0.6 per cent. At the same time, real prices for properties with taxation values above 75,000 SEK fell slightly, by 0.4 per cent a year.

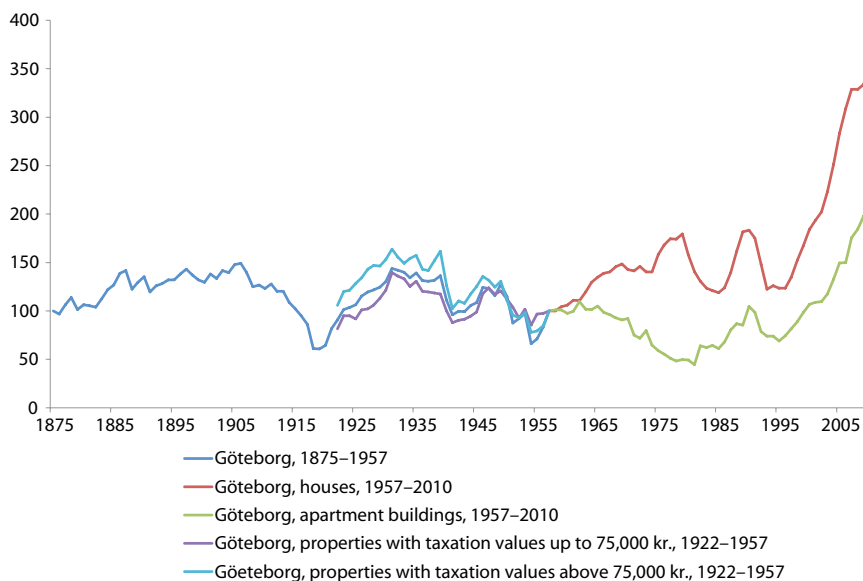
#### 2.4.2. Long-run evolution of prices, 1875–2010

In Figure 2.11, our price index series for 1875–1957 is linked to SCB's series for 1957–2010. It can be seen that price increases accelerated in the post-war period. However, much of this development is explained by the increase in the general price level. In a secular perspective it is arguably of more interest to look at the evolution of real prices. Figure 2.12 shows that from the late 19th century up to 1995 there is no long-run trend in real prices for residential properties. There were periods of two or even three decades when real prices rose but they always alternated with periods when real prices fell. For example, real prices rose in the period 1875–1895 but this increase disappeared when consumer prices rose much faster than residential property prices during the First World War. Real prices for residential properties recovered in the 1920s and declined again in the 1930s. As we have seen, in the post-war period there was a similar alternation between ups and downs. Real prices rose rapidly from the mid-1950s up to the late 1970s and then fell sharply until the mid-1980s. Another strong increase followed until the economic crisis in 1990–1993



**Figure 2.11.** Evolution of nominal prices for residential properties, 1875–2010 (1957=100).

Sources: See Table A2.2 and Söderberg, Blöndal and Edvinsson (2014) of this volume.

**Figure 2.12.** Evolution of real prices for residential property, 1875–2010 (1957=100).

Sources: See Table A2.2, Edvinsson and Söderberg (2010), and Söderberg, Blöndal and Edvinsson (2014) of this volume.



*Wiring (1907–1908) at the corner of Kyrkogatan and Korsgatan, Göteborg.*

Source: Göteborg City Museum.

caused an equally sharp drop. In the mid-1990s the level of real prices was approximately the same as a century earlier.

Since the mid-1990s, nominal prices for houses have risen at much the same rate as in the 1960s and 1970s but as consumer price inflation has fallen back to low single-digit figures, house prices have risen strongly in real terms. At the time of writing, real house prices have been rising for more than 15 years to a degree that appears to be unprecedented in a historical perspective. Real prices for apartment buildings have also risen since the mid-1990s, although not as rapidly as for houses. The main difference between houses and apartment buildings is, however, the decline in real prices for apartment buildings in the 1960s and 1970s when real prices for houses rose rapidly.

## 2.5. Summary and conclusions

The main contribution of this chapter is a new series of price index numbers for residential property in Göteborg, 1875–1957. Constructing price indexes for residential property raises several methodological problems, mainly because the sample of properties is made up of heterogeneous objects that are sold infrequently. In order to compare prices at a point in time, different properties must obviously be related to



*Käkbensgatan, Majorna, Göteborg in 1921, by Axel Harman. Many of the houses in Majorna were built in wood.*

Source: Göteborg City Museum.

a common standard. Our preferred series has been constructed by means of the sales price appraisal ratio method, where sales prices are deflated by taxation values, the idea being that the latter reflect quality differences between properties. This is also the method which Sweden's central statistical agency, Statistics Sweden (SCB), uses to construct price indexes for residential properties. We have also applied another method, repeated sales regressions, to a sub-sample of our data. While the series do differ in some respects, both their overall levels and their overall patterns of development are similar.

Since the new price index series for residential property in Göteborg is based on a limited sample, it should be used with caution as a measure of annual changes in prices. We are, however, confident about the level of the series, as well as the overall pattern of development, where distinct periods are discernible.

Between 1875 and 1895 there was no clear trend in residential property prices. This was followed by an average annual increase of roughly 3 per cent until 1906 and then a decline at an annual rate of around 2 per cent until the First World War. Wartime inflation caused prices to rise for residential properties but by not nearly as much as prices in general. Prices for residential properties then fell during the post-war deflation and rose again in the 1920s. In the 1930s, residential property prices in Göteborg hardly changed. From the early 1940s until the 1950s they increased rap-

idly along with the generally higher rate of inflation. In the entire period 1875–1957, prices for residential properties rose at an average annual rate of 1.6 per cent.

In real terms, i.e. nominal residential property prices deflated by a consumer price index, the picture is very different, with no clear long-run trend between 1875 and the 1950s. In other words, prices for residential properties increased at much the same rate as the overall price level. But even in real terms there are distinct periods. Real prices for residential properties followed a rising trend from 1875 to 1906 and then fell steeply up to the end of the First World War. After an upward development in the 1920s, most of the fall in 1906–1918 had been recovered by the beginning of the 1930s. Real prices for residential properties then fell slightly during the 1930s and sharply when inflation increased during the Second World War and its aftermath. A general pattern seems to be that in the period 1875–1957, residential property prices fluctuated less than consumer prices and therefore rose in real terms during periods of deflation and fell during periods of inflation.

From 1957 onwards the new price index for Göteborg is linked to data from SCB. Since the 1950s, the long-term increase in nominal prices for residential properties has been stronger than before. Generally, prices have risen more rapidly in the major cities, Stockholm and Göteborg, than in Sweden as a whole. Except in the 1980s, prices have also risen more rapidly for houses than for apartment buildings. Data from Göteborg also suggest that at least since the beginning of the 1940s, prices for properties with low taxation values, many of which were no doubt owner-occupied houses, have risen more rapidly than for those with high taxation values. The fact that prices for apartment buildings have risen more slowly than for houses is probably related to the system of rent regulation (*hyresreglering*) that was in place in Sweden from 1942.

Of interest when studying the evolution of prices for residential properties is how they compare with the evolution of the general price level. Since the 1950s, nominal residential property prices have risen faster than prices overall, which gives an increase in real terms. Most of this increase has occurred since the mid-1990s. From 1875 until the mid-1990s there is no clear long-term trend in real prices for residential properties and the sharp increase in the past two decades is historically unprecedented.

## Appendix

**Table A2.1.** *Ratio of average taxation values in years of general taxation assessments to the values in the previous period.*

| Year of general taxation assessment | Average | Standard deviation | Max  | Min  | N   |
|-------------------------------------|---------|--------------------|------|------|-----|
| 1876                                | 1.13    | 0.15               | 1.76 | 0.65 | 174 |
| 1879                                | 1.08    | 0.14               | 1.75 | 0.74 | 186 |
| 1882                                | 1.02    | 0.11               | 1.80 | 0.60 | 197 |
| 1884                                | 1.12    | 0.17               | 1.91 | 0.81 | 170 |
| 1887                                | 1.02    | 0.15               | 1.70 | 0.54 | 177 |
| 1890                                | 0.99    | 0.07               | 1.24 | 0.75 | 176 |
| 1893                                | 1.04    | 0.10               | 1.65 | 0.80 | 196 |
| 1896                                | 1.02    | 0.06               | 1.38 | 0.78 | 197 |
| 1898                                | 1.03    | 0.09               | 1.54 | 0.93 | 192 |
| 1903                                | 1.05    | 0.12               | 1.50 | 0.55 | 190 |
| 1908                                | 1.06    | 0.12               | 1.50 | 0.67 | 184 |
| 1913                                | 1.03    | 0.08               | 1.38 | 0.67 | 342 |
| 1918                                | 1.18    | 0.19               | 1.98 | 0.42 | 344 |
| 1922                                | 1.19    | 0.16               | 1.79 | 0.79 | 333 |
| 1928                                | 1.10    | 0.13               | 1.51 | 0.70 | 276 |
| 1933                                | 1.03    | 0.08               | 1.45 | 0.67 | 230 |
| 1938                                | 1.02    | 0.09               | 1.45 | 0.67 | 209 |
| 1945                                | 1.03    | 0.07               | 1.48 | 0.86 | 222 |
| 1952                                | 1.19    | 0.12               | 2.23 | 1.00 | 191 |

Sources: Göteborgs address- och industrikalender, 1875–1947; GBG-boken 1952–1953.

**Table A2.2.** Yearly average sales price ratios and index series for taxation assessment values and prices of residential properties, 1875–1952 (1912=100).

|      | Average sales price appraisal ratio | Standard deviation | Min  | Max  | N   | Index of taxation values, residential properties | Price index, residential properties |
|------|-------------------------------------|--------------------|------|------|-----|--|-------------------------------------|
| 1875 | 1.32                                | 0.29               | 0.73 | 2.10 | 81  | 58   | 76                                  |
| 1876 | 1.28                                | 0.29               | 0.72 | 2.00 | 57  | 58   | 74                                  |
| 1877 | 1.24                                | 0.26               | 0.71 | 1.90 | 44  | 66   | 81                                  |
| 1878 | 1.21                                | 0.30               | 0.58 | 1.85 | 37  | 66   | 79                                  |
| 1879 | 1.03                                | 0.23               | 0.57 | 1.60 | 40  | 66   | 67                                  |
| 1880 | 1.06                                | 0.22               | 0.57 | 1.77 | 53  | 71   | 75                                  |
| 1881 | 1.07                                | 0.17               | 0.54 | 1.55 | 64  | 71   | 76                                  |
| 1882 | 1.05                                | 0.22               | 0.60 | 1.63 | 52  | 71   | 74                                  |
| 1883 | 1.09                                | 0.27               | 0.54 | 2.14 | 75  | 73   | 78                                  |
| 1884 | 1.14                                | 0.32               | 0.75 | 2.22 | 61  | 73   | 82                                  |
| 1885 | 1.00                                | 0.18               | 0.60 | 1.49 | 82  | 81   | 81                                  |
| 1886 | 1.04                                | 0.26               | 0.50 | 1.94 | 69  | 81   | 84                                  |
| 1887 | 1.00                                | 0.23               | 0.61 | 1.88 | 73  | 81   | 81                                  |
| 1888 | 0.90                                | 0.17               | 0.52 | 1.53 | 83  | 83   | 74                                  |
| 1889 | 0.98                                | 0.24               | 0.53 | 1.82 | 75  | 83   | 81                                  |
| 1890 | 1.04                                | 0.30               | 0.53 | 1.89 | 80  | 83   | 86                                  |
| 1891 | 0.99                                | 0.19               | 0.58 | 1.67 | 87  | 82   | 81                                  |
| 1892 | 1.00                                | 0.19               | 0.62 | 1.61 | 66  | 82   | 81                                  |
| 1893 | 0.99                                | 0.22               | 0.56 | 1.65 | 63  | 82   | 81                                  |
| 1894 | 0.93                                | 1.22               | 0.53 | 1.70 | 91  | 86   | 79                                  |
| 1895 | 0.93                                | 0.14               | 0.65 | 1.27 | 76  | 86   | 79                                  |
| 1896 | 0.98                                | 0.22               | 0.52 | 1.75 | 62  | 86   | 83                                  |
| 1897 | 1.04                                | 0.21               | 0.58 | 1.79 | 88  | 87   | 90                                  |
| 1898 | 1.03                                | 0.20               | 0.59 | 1.75 | 110 | 87   | 89                                  |
| 1899 | 1.02                                | 0.18               | 0.57 | 1.56 | 72  | 90   | 91                                  |
| 1900 | 1.03                                | 0.19               | 0.74 | 1.76 | 80  | 90   | 92                                  |
| 1901 | 1.09                                | 0.27               | 0.50 | 2.10 | 89  | 90   | 97                                  |
| 1902 | 1.06                                | 0.26               | 0.51 | 1.95 | 95  | 90   | 94                                  |
| 1903 | 1.12                                | 0.28               | 0.74 | 2.15 | 71  | 90   | 100                                 |
| 1904 | 1.05                                | 0.24               | 0.60 | 1.92 | 76  | 94   | 98                                  |
| 1905 | 1.13                                | 0.28               | 0.62 | 2.19 | 95  | 94   | 106                                 |
| 1906 | 1.18                                | 0.32               | 0.55 | 2.29 | 99  | 94   | 110                                 |
| 1907 | 1.16                                | 0.24               | 0.76 | 2.0  | 72  | 94   | 108                                 |
| 1908 | 1.06                                | 0.31               | 0.50 | 2.06 | 48  | 94   | 99                                  |
| 1909 | 1.00                                | 0.21               | 0.57 | 1.79 | 79  | 100  | 99                                  |
| 1910 | 0.97                                | 0.22               | 0.54 | 1.83 | 65  | 100  | 96                                  |

**Table A2.2 (cont.).** Yearly average sales price ratios and index series for taxation assessment values and prices of residential properties, 1875–1952 (1912=100).

|      | Average sales price appraisal ratio | Standard deviation | Min  | Max  | N   | Index of taxation values, residential properties | Price index, residential properties |
|------|-------------------------------------|--------------------|------|------|-----|--|-------------------------------------|
| 1911 | 1.02                                | 0.23               | 0.58 | 1.86 | 62  | 100  | 101                                 |
| 1912 | 1.01                                | 0.20               | 0.63 | 1.65 | 69  | 100  | 100                                 |
| 1913 | 1.02                                | 0.18               | 0.72 | 1.67 | 83  | 100  | 101                                 |
| 1914 | 0.91                                | 0.12               | 0.59 | 1.14 | 61  | 103  | 93                                  |
| 1915 | 0.98                                | 0.18               | 0.64 | 1.63 | 57  | 103  | 100                                 |
| 1916 | 1.03                                | 0.12               | 0.71 | 1.39 | 77  | 103  | 105                                 |
| 1917 | 1.18                                | 0.25               | 0.67 | 2.06 | 79  | 103  | 120                                 |
| 1918 | 1.23                                | 0.3                | 0.76 | 2.34 | 131 | 103  | 125                                 |
| 1919 | 1.14                                | 0.19               | 0.88 | 1.67 | 97  | 122  | 137                                 |
| 1920 | 1.23                                | 0.21               | 0.86 | 2.00 | 116 | 122  | 148                                 |
| 1921 | 1.28                                | 0.29               | 0.87 | 2.15 | 53  | 122  | 154                                 |
| 1922 | 1.18                                | 0.22               | 0.56 | 2.03 | 83  | 122  | 142                                 |
| 1923 | 1.05                                | 0.16               | 0.52 | 1.59 | 92  | 145  | 150                                 |
| 1924 | 1.07                                | 0.17               | 0.58 | 1.55 | 80  | 145  | 153                                 |
| 1925 | 1.12                                | 0.16               | 0.74 | 1.60 | 86  | 145  | 160                                 |
| 1926 | 1.17                                | 0.19               | 0.63 | 1.62 | 83  | 145  | 168                                 |
| 1927 | 1.2                                 | 0.17               | 0.81 | 1.79 | 78  | 145  | 172                                 |
| 1928 | 1.23                                | 0.18               | 0.91 | 1.75 | 57  | 145  | 176                                 |
| 1929 | 1.13                                | 0.19               | 0.72 | 1.80 | 74  | 159  | 178                                 |
| 1930 | 1.14                                | 0.21               | 0.57 | 1.83 | 79  | 159  | 180                                 |
| 1931 | 1.22                                | 0.23               | 0.86 | 2.07 | 48  | 159  | 192                                 |
| 1932 | 1.19                                | 0.32               | 0.56 | 2.38 | 58  | 159  | 187                                 |
| 1933 | 1.14                                | 0.25               | 0.66 | 1.90 | 83  | 159  | 180                                 |
| 1934 | 1.07                                | 0.24               | 0.52 | 1.88 | 70  | 164  | 174                                 |
| 1935 | 1.13                                | 0.26               | 0.61 | 2.07 | 82  | 164  | 183                                 |
| 1936 | 1.08                                | 0.19               | 0.58 | 1.67 | 79  | 164  | 175                                 |
| 1937 | 1.11                                | 0.22               | 0.66 | 1.67 | 98  | 164  | 180                                 |
| 1938 | 1.14                                | 0.26               | 0.61 | 2.14 | 92  | 164  | 185                                 |
| 1939 | 1.19                                | 0.29               | 0.50 | 2.33 | 124 | 167  | 197                                 |
| 1940 | 1.10                                | 0.16               | 0.69 | 1.44 | 47  | 167  | 182                                 |
| 1941 | 1.08                                | 0.21               | 0.50 | 1.36 | 64  | 167  | 179                                 |
| 1942 | 1.20                                | 0.24               | 0.63 | 2.21 | 75  | 167  | 199                                 |
| 1943 | 1.20                                | 0.24               | 0.50 | 1.94 | 82  | 167  | 199                                 |
| 1944 | 1.27                                | 0.28               | 0.64 | 2.22 | 90  | 167  | 210                                 |
| 1945 | 1.30                                | 0.29               | 0.52 | 2.4  | 100 | 167  | 215                                 |
| 1946 | 1.45                                | 0.38               | 0.55 | 2.58 | 85  | 172  | 247                                 |

**Table A2.2 (cont.).** Yearly average sales price ratios and index series for taxation assessment values and prices of residential properties, 1875–1952 (1912=100).

|      | Average sales price appraisal ratio | Standard deviation | Min  | Max  | N   | Index of taxation values, residential properties | Price index, residential properties |
|------|-------------------------------------|--------------------|------|------|-----|--|-------------------------------------|
| 1947 | 1.48                                | 0.34               | 1.00 | 2.81 | 57  | 172  | 252                                 |
| 1948 | 1.47                                | 0.4                | 0.95 | 2.78 | 39  | 172  | 251                                 |
| 1949 | 1.63                                | 0.41               | 1.00 | 2.32 | 30  | 172  | 278                                 |
| 1950 | 1.49                                | 0.39               | 0.91 | 2.36 | 43  | 172  | 254                                 |
| 1951 | 1.33                                | 0.48               | 0.60 | 2.57 | 65  | 172  | 227                                 |
| 1952 | 1.50                                | 0.56               | 0.50 | 2.86 | 48  | 172  | 256                                 |
| 1953 | 1.34                                | 0.4                | 0.55 | 2.50 | 44  | 205  | 272                                 |
| 1954 | 0.92                                | 0.23               | 0.52 | 1.83 | 268 | 205  | 187                                 |
| 1955 | 1.01                                | 0.37               | 0.51 | 2.08 | 156 | 205  | 205                                 |
| 1956 | 1.25                                | 0.54               | 0.53 | 2.98 | 89  | 205  | 254                                 |
| 1957 | 1.56                                | 0.52               | 0.83 | 2.73 | 29  | 205  | 316                                 |

Sources: Göteborgs address- och industrikalender, 1875–1947; Göteborgs landsarkiv. Göteborgs Rådhusrätt och magistrat 1:a avdelningen före år 1900, A II a Lagfartsprotokoll; Göteborgs landsarkiv, Göteborgs Rådhusrätt och magistrat 1:a avdelningen efter 1901, A II aa Lagfartsprotokoll 1901–1939, A II ad Inskrivningsakter 1940–1967.



**Table A2.3.** *Price indexes for residential property in Göteborg 1874–1957, calculated by means of the repeated sales method.*

|      | Bailey et al.'s method | Case & Shiller's method |
|------|------------------------|-------------------------|
| 1875 | 100                    | 100                     |
| 1876 | 110                    | 110                     |
| 1877 | 120                    | 121                     |
| 1878 | 101                    | 106                     |
| 1879 | 111                    | 114                     |
| 1880 | 96                     | 99                      |
| 1881 | 107                    | 108                     |
| 1882 | 107                    | 108                     |
| 1883 | 107                    | 106                     |
| 1884 | 120                    | 119                     |
| 1885 | 105                    | 105                     |
| 1886 | 115                    | 114                     |
| 1887 | 118                    | 117                     |
| 1888 | 114                    | 111                     |
| 1889 | 111                    | 108                     |
| 1890 | 120                    | 119                     |
| 1891 | 121                    | 120                     |
| 1892 | 125                    | 123                     |
| 1893 | 130                    | 126                     |
| 1894 | 114                    | 112                     |
| 1895 | 123                    | 120                     |
| 1896 | 120                    | 118                     |
| 1897 | 123                    | 119                     |
| 1898 | 136                    | 132                     |
| 1899 | 124                    | 120                     |
| 1900 | 135                    | 130                     |
| 1901 | 132                    | 126                     |
| 1902 | 134                    | 129                     |
| 1903 | 141                    | 136                     |
| 1904 | 141                    | 136                     |
| 1905 | 139                    | 134                     |
| 1906 | 152                    | 145                     |
| 1907 | 153                    | 147                     |
| 1908 | 146                    | 138                     |

**Table A2.3 (cont.).** Price indexes for residential property in Göteborg 1874–1957, calculated by means of the repeated sales method.

|      | Bailey et al.'s method | Case & Shiller's method |
|------|------------------------|-------------------------|
| 1909 | 143                    | 136                     |
| 1910 | 142                    | 135                     |
| 1911 | 151                    | 142                     |
| 1912 | 145                    | 138                     |
| 1913 | 145                    | 137                     |
| 1914 | 144                    | 136                     |
| 1915 | 145                    | 138                     |
| 1916 | 151                    | 142                     |
| 1917 | 180                    | 169                     |
| 1918 | 184                    | 173                     |
| 1919 | 196                    | 184                     |
| 1920 | 211                    | 195                     |
| 1921 | 203                    | 182                     |
| 1922 | 197                    | 183                     |
| 1923 | 217                    | 203                     |
| 1924 | 215                    | 200                     |
| 1925 | 238                    | 223                     |
| 1926 | 242                    | 223                     |
| 1927 | 229                    | 211                     |
| 1928 | 240                    | 219                     |
| 1929 | 243                    | 221                     |
| 1930 | 246                    | 225                     |
| 1931 | 251                    | 227                     |
| 1932 | 236                    | 214                     |
| 1933 | 218                    | 198                     |
| 1934 | 222                    | 200                     |
| 1935 | 222                    | 205                     |
| 1936 | 246                    | 222                     |
| 1937 | 213                    | 192                     |
| 1938 | 224                    | 203                     |
| 1939 | 235                    | 210                     |
| 1940 | 230                    | 210                     |
| 1941 | 211                    | 188                     |
| 1942 | 222                    | 201                     |
| 1943 | 241                    | 218                     |

**Table A2.3 (cont.).** *Price indexes for residential property in Göteborg 1874–1957, calculated by means of the repeated sales method.*

|      | Bailey et al's method | Case & Shiller's method |
|------|-----------------------|-------------------------|
| 1944 | 259                   | 231                     |
| 1945 | 241                   | 216                     |
| 1946 | 280                   | 249                     |
| 1947 | 318                   | 282                     |
| 1948 | 314                   | 278                     |
| 1949 | 351                   | 304                     |
| 1950 | 320                   | 282                     |
| 1951 | 310                   | 275                     |
| 1952 | 340                   | 299                     |
| 1953 | 368                   | 322                     |
| 1954 | 303                   | 270                     |
| 1955 | 378                   | 333                     |
| 1956 | 350                   | 315                     |
| 1957 | 370                   | 320                     |

Sources: Göteborgs landsarkiv, Göteborgs Rådhusrätt och magistrat 1:a avdelningen före år 1900. A II a Lagfartsprotokoll; Göteborgs landsarkiv, Göteborgs Rådhusrätt och magistrat 1:a avdelningen efter 1901, A II aa Lagfartsprotokoll 1901–1939, A II ad Inskrivningsakter 1940–1967.

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