

Trends in Affordable Home Ownership in Calgary

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Trends in Affordable Home Ownership in Calgary 1980–2000

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1.0 Executive Summary

- This analysis was prepared in response to a request to quantify the need for affordable housing in Calgary. The report does not attempt to estimate the extent of homelessness in the city.
- The report is developed to estimate the number of households in need of affordable housing in Calgary. Owner households that spend more than 32 percent (the Gross Debt Service Ratio) of their pre-tax income on housing are regarded as in need of affordable housing.
- The study's estimates cover the period from 1980 to 2000.
- The number of owner households in need of affordable housing was shown to fluctuate between 26,644 and 52,065 in the period 1980 to 2000. The variation in the number of households requiring affordable housing is explained by the combination of the changes to the price of housing, the mortgage rate and household income.
- The average number of households requiring affordable housing over the period 1980 to 2000 was 41,000 households.
- The analysis showed that housing affordability improved in Calgary over the 1996 to 2000 period, despite increase in house prices. The improvement in affordability resulted from a reduction in mortgage rates and increase in household income.

2.0 Introduction

This analysis is prepared in response to a request from the Affordable Housing Implementation Team to assist in quantifying the need for affordable housing in the home ownership market.¹ Even though housing affordability plays a pivotal role in determining homelessness (TD Economics 2003), this report does not attempt to quantify homelessness in Calgary. Instead, the report's purpose is to estimate the number of households in need of affordable housing.

The housing market is made up of two broad categories of products: new and resale houses. Within each of these categories, houses are available in a variety of sizes, shapes and locations. The study assumes that resale housing is a proxy for the entire housing market. This is a reasonable assumption since resale and new houses can be readily substituted for each other. The study therefore uses resale housing to represent the entire housing market. The reason for choosing this segment of the market to represent the total market is the ready availability of resale housing data from the Calgary Real Estate Board (CREB).

1 The terms need and demand are used interchangeably in this report. Demand is generally defined in economics as desires that are backed by money. The consumer is assumed to have the money to purchase the good or service. Given the nature of the product and the lack of an effective substitute for housing, the study assumes that need for housing cannot be readily substituted for. The desire for housing would always be there regardless of whether money is available or not.

In this study, housing affordability is defined as “having the financial capacity to purchase the average resale house.”² Canada has an unofficial definition of housing affordability for home ownership, which is based on guidelines from Canada Housing and Mortgage Corporation (Jackson 2004; CMHC, 2002: 13). This states that households should not spend more than 32 percent (the Gross Debt Service Ratio) of their before tax income on house payments. The report attempts to estimate the number of households who could or could not have afforded to purchase housing in Calgary from the 1980 to 2000.

3.0 Methodology

This section is divided into two parts. The first outlines the steps for estimating the number of families that cannot afford the average price for resale housing in Calgary. The second outlines the framework for estimating the quantitative relationship between housing affordability or unaffordability and variables such as household income, house price and mortgage rates. The intent here is to estimate the relative magnitude of the variables that affect the demand for affordable housing.

Estimating the Number of Households in Need of Affordable Housing

The number of households in Calgary who cannot afford resale housing for a given year was estimated as follows:

1. The house price and the mortgage rate were used in the equation below to produce the mortgage payment.³
2. Municipal taxes are calculated by multiplying the house price by the property tax rate.
3. The utility bill for an average family is assumed to be 4.3 percent of the house price.
4. The information in steps 1 to 3 is summed to produce an estimate of the total housing cost that a family faces when they own a home.
5. The income that is required to purchase a home is estimated by dividing the housing costs by the Gross Debt Service Ratio (GDSR).
6. The result from step 5 was compared against the household income distribution table for a given year in question. This shows the percentage of families in Calgary who should have an income equal to or greater than that was estimated in step 5.
7. The population for the given year is divided by the average household size to produce the number of households.
8. The number of households times the result from step 6 produces the number of families qualified to purchase a house given the price.

² The following definition of affordable housing was approved by Calgary City Council in July 2002, which incorporates income data from the 2001 Canada Census. This definition is used for The City of Calgary’s ongoing research and planning activities: “Affordable housing adequately suits the needs of low- and moderate-income households at costs below those generally found in the Calgary market. It may take a number of forms that exist along a continuum— from emergency shelters, to transitional housing, to non-market rental (also known as social or subsidized housing), to formal and informal rental, and ending with affordable home ownership. Affordable housing projects are targeted to households with 65 percent or less of the area median income. In the city of Calgary, affordable housing initiatives would be targeted to those with a gross income below \$37,621. For housing to be affordable, the Canada Mortgage and Housing Corporation has defined that a household should not spend more than 30 percent of gross income on [rental] shelter costs” or 32 percent of gross income on home ownership (City of Calgary, 2002; Statistics Canada, 2003; CMHC, 1991: 4; 2002:13).

³ PMT (rate, nper, pv, fv, type)
Rate is the interest rate for the loan.
Nper is the total number of payments for the loan.
Pv is the present value, or the total amount that a series of future payments is worth now; also known as the principal.
Fv is the future value, or a cash balance you want to attain after the last payment is made. If fv is omitted, it is assumed to be 0 (zero), that is, the future value of a loan is 0.
Type is either the number 0 (zero) or 1, and indicates when payments are due.

9. The difference between the results in steps 7 and 8 would provide an estimate of the number of families that are not qualified to purchase a house.
10. Since some of these families would already be home owners, the estimates in step 9 would overstate the problem of housing affordability. The result had to be adjusted by multiplying it by the percentage of the population that did not consist of home owners.

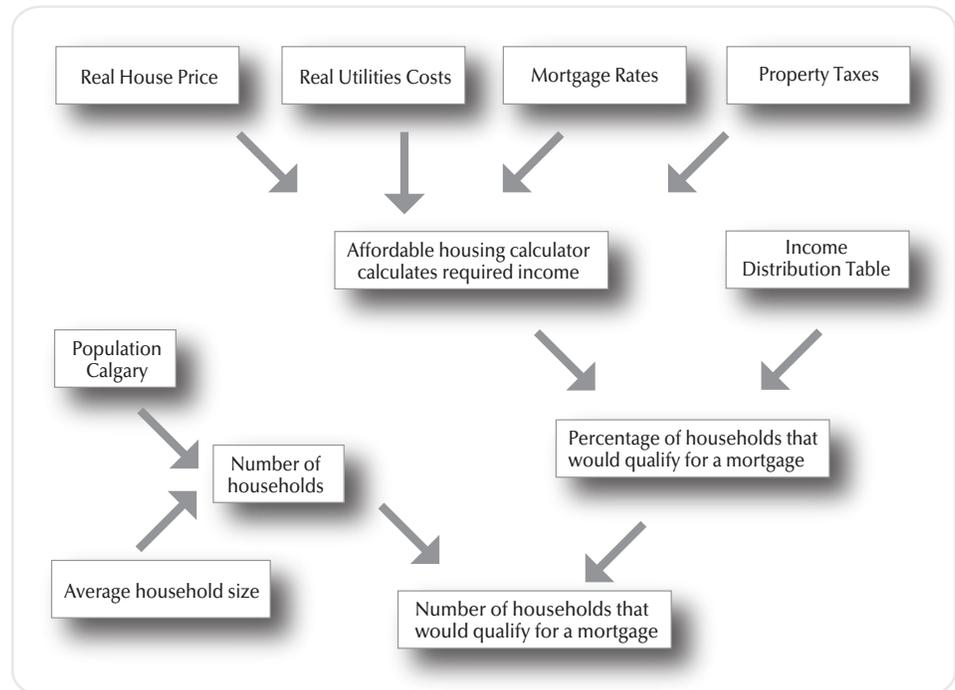


Figure 1: Calculation of the Number of Qualifiers

Estimating the Demand for Affordable Housing

The correlation between the demand for affordable housing and the real house price is expected to be positive (Figure 3). The higher the real house price, assuming all things are equal, the more the monthly mortgage payments become. Consequently, prospective home owners require higher incomes to qualify for a mortgage. Given that housing is a necessity and cannot be readily substitute for, the demand for affordable housing should increase.

DAH = F(RHP, RIR, MI)

where :

DAH = Demand for Affordable Housing

RHP = Real House Price

RIR = Real Interest Rate

MI = Real Median Income

Figure 2: Demand for Affordable Housing Formula

The correlation between the demand for affordable housing and the real mortgage interest rate (Figure 4) is expected to be positive. An increase in the real interest rate is expected to increase the homeowners’ mortgage payments. Consequently, the amount of income that is required to cover the higher mortgage payments should reduce the demand for market-based housing as some households are unable to meet the income threshold. The demand for assisted housing is expected to increase.

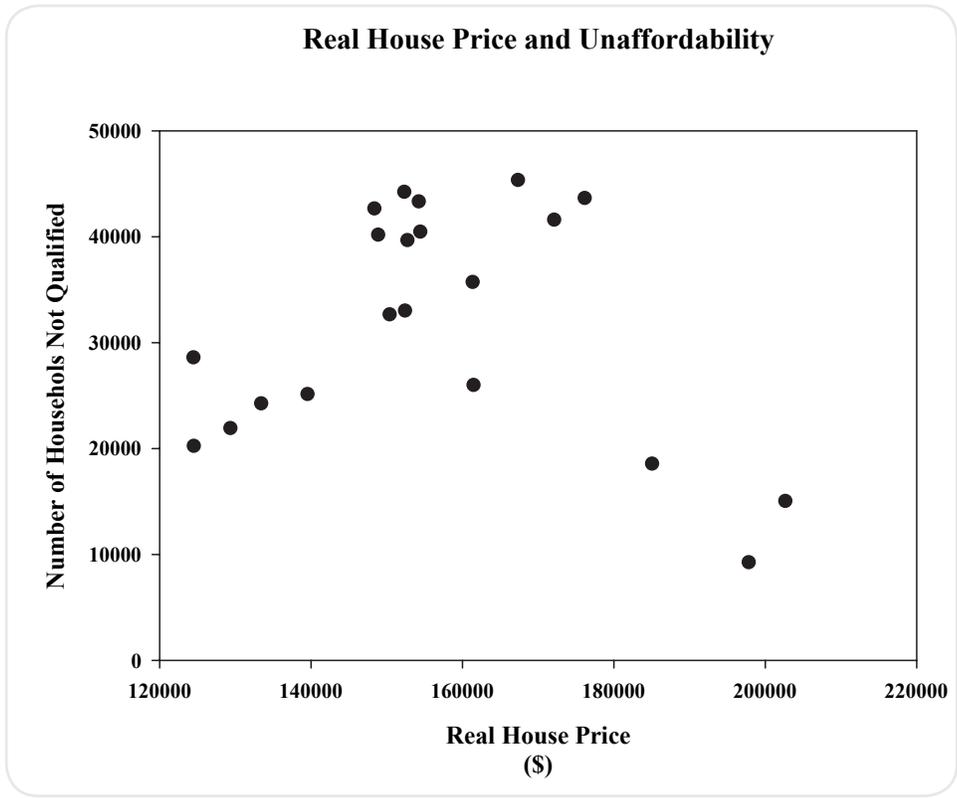


Figure 3: Relationship between House Price and Unaffordability

The correlation between the demand for affordable housing and the median household income is expected to be negative (Figure 5). The higher the household income, the more market based housing the household could afford. Consequently, the total demand for assisted housing should fall.

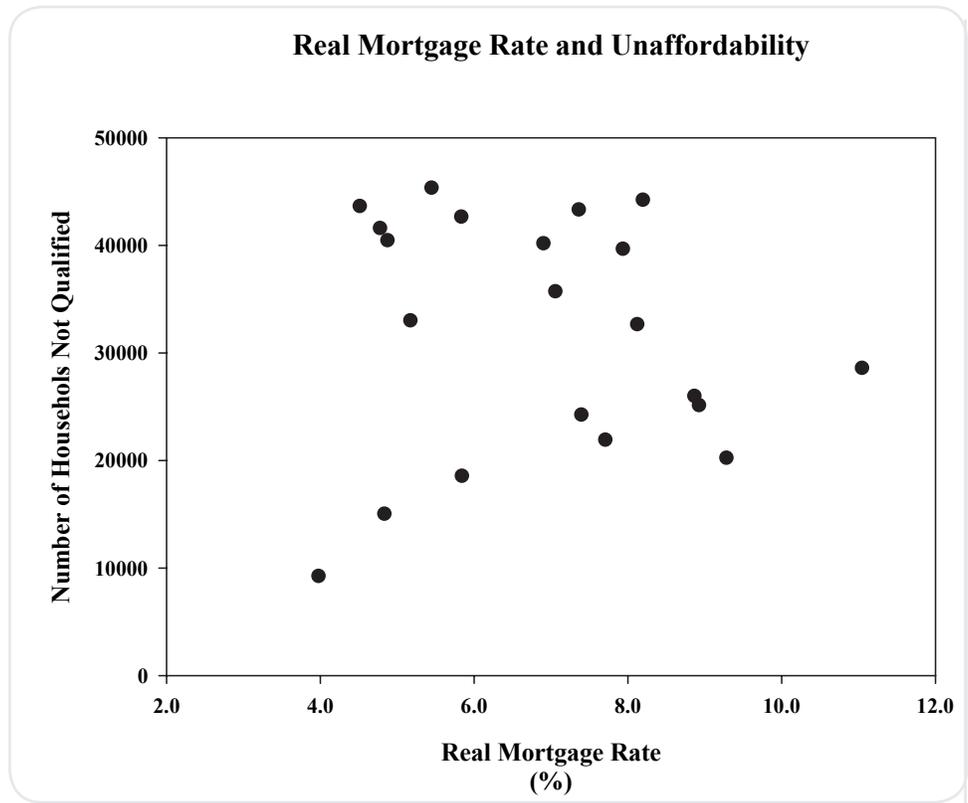


Figure 4: Relationship between Mortgage Rate and Unaffordability

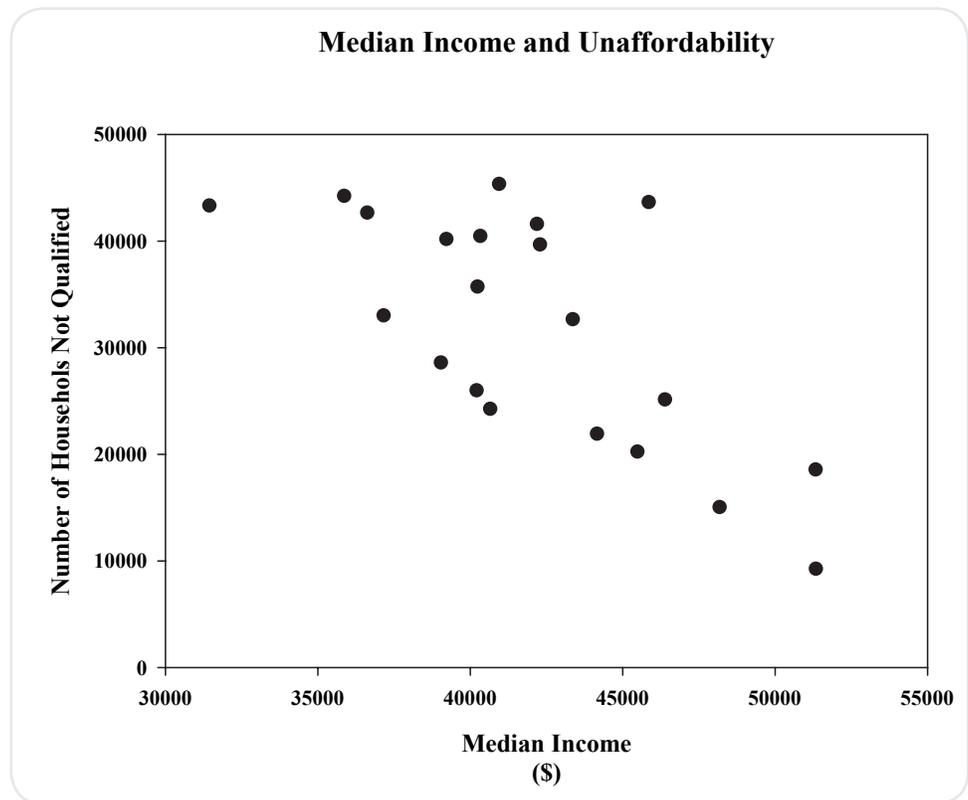


Figure 5: Relationship between Income and Unaffordability

4.0 Data

The estimates for housing affordability in Calgary were based on a number of data sources.

4.1 House Price

House price data for the period 1980 to 2000 was taken from data published by the Calgary Real Estate Board (Figure 6). The data represents the arithmetic average of the prices of all houses sold during a given year. This statistics was adjusted for inflation by using the consumer price index and expressed in 2000 dollar values throughout this paper.

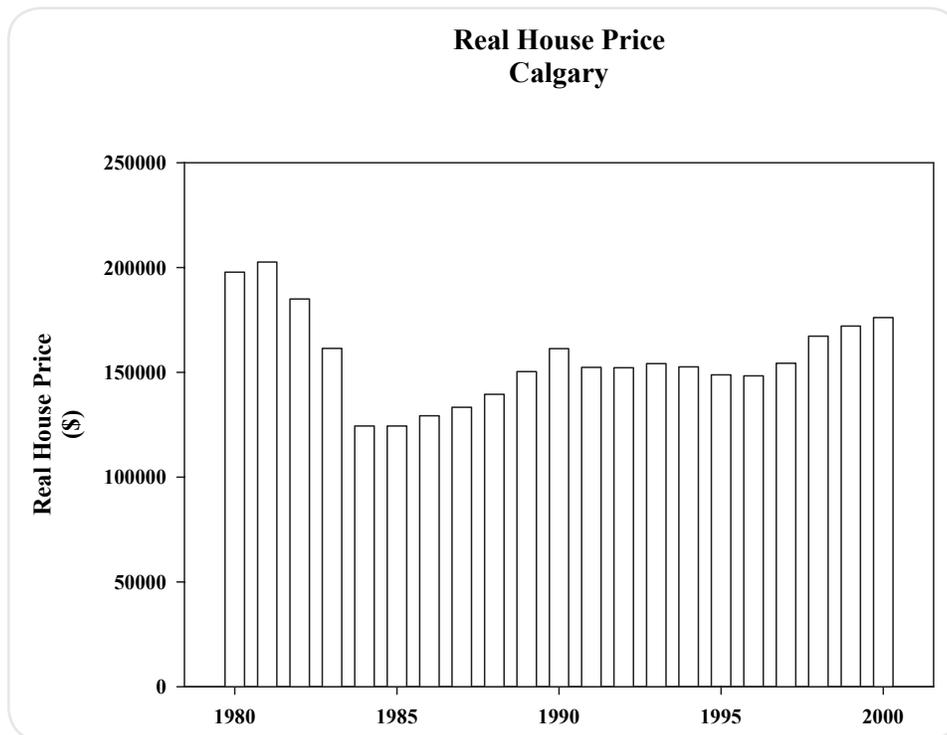


Figure 6: Average House Price in Calgary

The data show that the resale house price exhibits a cyclical pattern over time. For example, it peaked in 1982, bottomed out in 1984 and then increased with some fluctuation, reaching its 2000 value of \$176,151. During, this period the average house price fluctuated between \$124,442 and \$202,654 and it had an estimated mean of \$156,598 (all values are in 2000 dollars).

4.2 Income

Again, using 2000 dollars, the average income in Calgary was \$59,321 in 1980 and this fell to \$58,362 in 2000, with obvious fluctuation.⁴ Similarly, the median income was estimated at \$51,335 in 1980 and fell to \$45,852 in 2000, again with obvious fluctuation.⁵ Both the mean and median provide similar views of income growth in Calgary over the 1980 to 2000 period. They showed that income failed to keep pace with inflation in that period.

⁴ The average is a summary statistics however, tends to be influenced by extreme values. It is the average of the scores in the population. For example, it equals the sum of the scores divided by the number of scores.

⁵ The median is also a summary statistic, however it is not influenced by extreme values. The median of a population is the point that divides the distribution of scores in half. Numerically, half of the scores in a population will have values that are equal to or larger than the median and half will have values that are equal to or smaller than the median.

The data shows that in 1980, 53.1 percent of Calgarians earned less than the average income of \$59,321 while, the median income was \$51,335. By 2000, the median income fell to \$45,852 and this meant that 50 percent of Calgarians earned less than that amount. While the number of individuals earning less than the 2000 average income, of \$58,362, rose to 59.2 percent, up from 53.1 percent in 1980. Looking at the data differently, it showed that the median/mean income ratio fell to 0.78 in 2000, from 0.82 in 1990 and 0.86 in 1980 (all in 2000 dollars). This resulted from the mean income growing at a faster rate than the median (Figure 6). The mean, which is clearly influenced by extreme values and in this case was higher than the median, meant that income in the higher-income households grew much faster than income in the lower-income households.

As shown in figure 7, in 2000, 6.3 percent of all households in Calgary earned over \$150,000 and 3.2 percent earned between \$125,000 and \$149,999. At the other extreme of the income scale, 10.4 percent of households earned less than \$5,000 and 5.5 percent earned between \$5,000 and \$9,000.

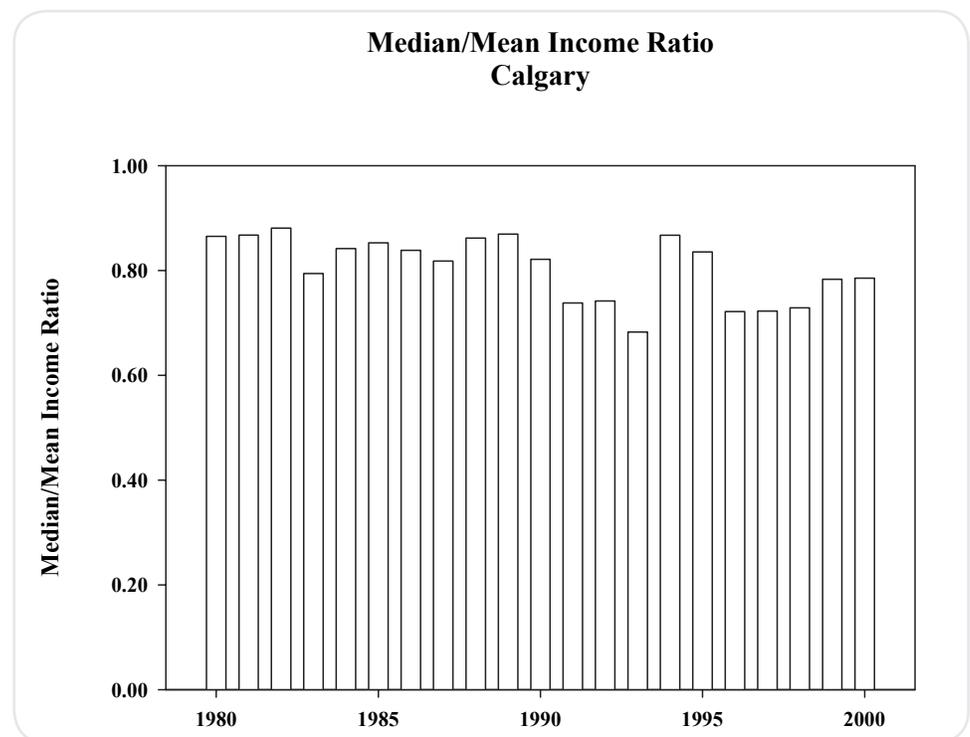


Figure 7: Median/Mean Income Ratio

The cumulative distribution shows that 6.3 percent of households had incomes in excess of \$150,000 and 9.5 percent of all households had incomes in excess of \$125,000. The data also shows that 89.6 percent of them had incomes in excess of \$5,000 and 84.1 percent in the \$10,000 to \$14,999 income range (Figure 8).

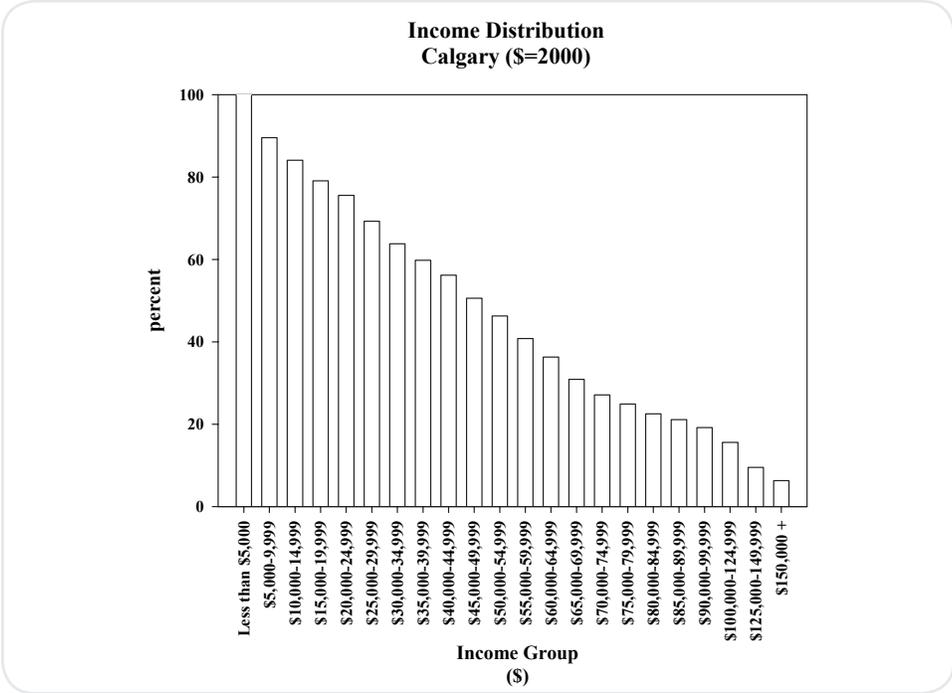


Figure 8: 2000 Income Distribution in Calgary

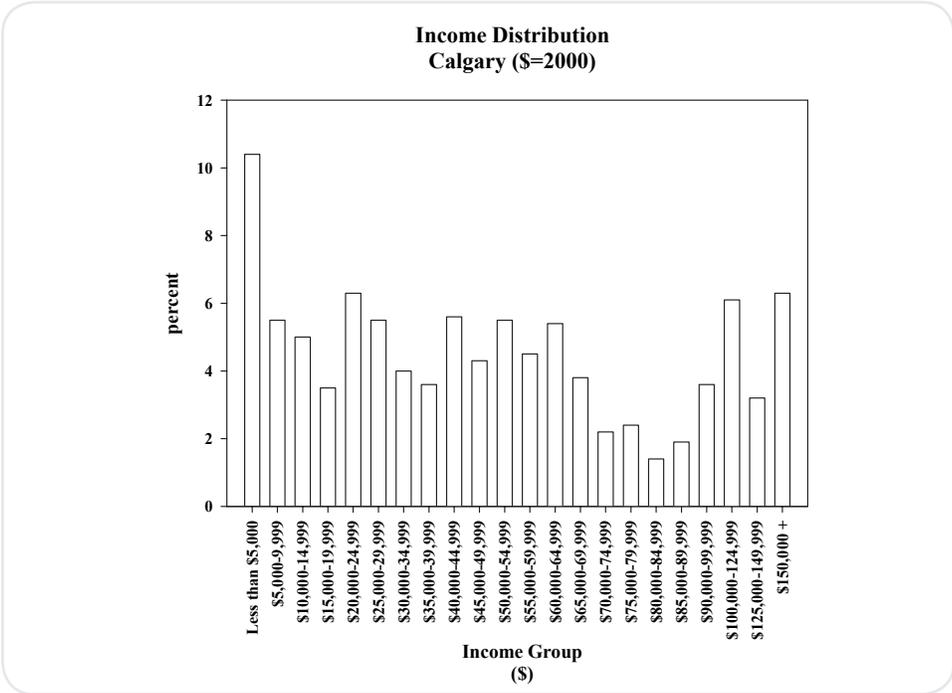


Figure 9: Income Distribution Calgary

4.3 Population

Calgary’s population was estimated at 560,566 persons in 1980 and 860,749 in 2000. In this period, the number of households increased from 201,852 units in 1980 to 332,260 units in 2000. The average household size was estimated at 2.8 persons in 1980 and fell to 2.6 persons in 2000.

5.0 Results

5.1 Estimating Number of Households in Need of Affordable Housing Mortgage Payments

The mortgage payment is estimated as a function of the mortgage rate and the real house price. The higher the mortgage rate the higher the estimated mortgage payment. Similarly, the higher the house price, the higher the mortgage payment (Figure 10).

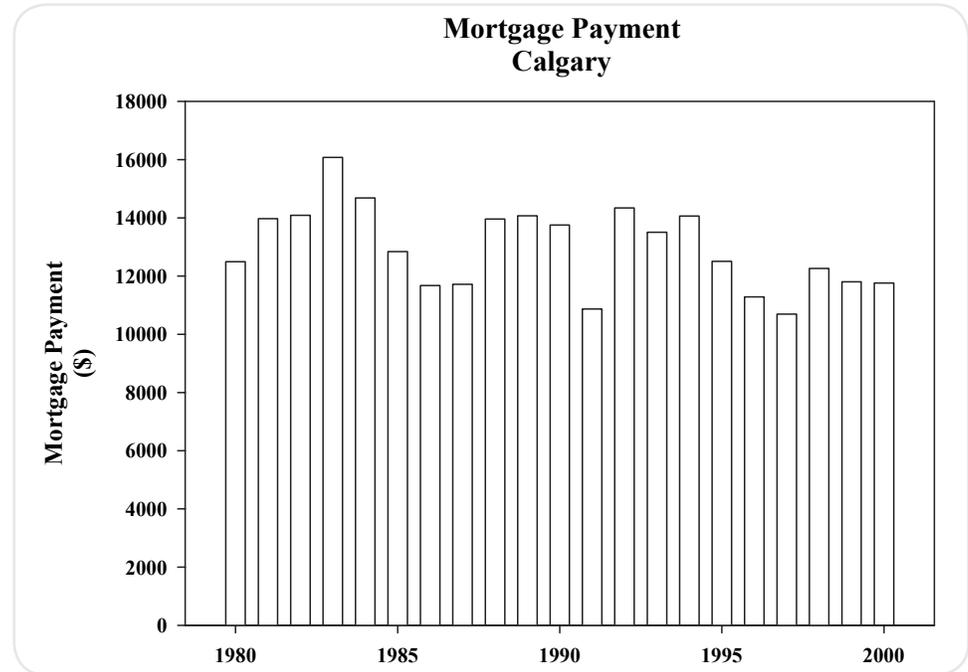


Figure 10: Mortgage Payments

The annual mortgage payment for 2000 was estimated at \$10,704 (2000\$), down from \$11,316 (2000\$) in 1980. During the 1980 to 2000 period, the mortgage payment moved in a cyclical manner which reflected the cyclical nature of the housing market and mortgage rates. For example in the early 1980s, mortgage payments peaked at \$14,630 (2000\$) in 1983 and then declined to bottom out at \$10,631 (2000\$) in 1985. On the whole, the trend in the mortgage payment was downward. This resulted from a sharp reduction in the mortgage, unadjusted for inflation. For example, the five year mortgage rate was estimated at 18.2 percent in 1981 and it fell to 8.2 percent by 2000.

5.2 Property Taxes

The property tax bill is estimated as the product of the tax rate and the assessed value of the house price. The tax rate in this analysis is used to represent the combined tax rates for municipal and education taxes that are levied on property at the local level. Since the tax rate data for the 1980 to 2000 period is not readily available, the property tax rate is assumed to be one percent of the house price.

The property tax bill was estimated at \$1,762 (2000\$) in 2000 and \$1,978 (2000\$) in 1980. Similar to the house price, the tax bill showed a cyclical pattern.

5.3 Utilities Cost

The utilities cost is estimated at \$750 (2000\$) in 2000. Because the data is not readily available, it is assumed that the 2000 “utilities / house price” ratio holds for the 1980 to 2000 period. As a result of this assumption, the estimated utility costs exhibits a similar cyclical pattern to the house price.

5.4 Housing Cost

The housing cost is estimated as the sum of the mortgage payment, the property tax bill and the utility cost. The largest component of housing cost is the mortgage cost.

Again using 2000 dollars, the housing costs was estimated at \$13,216 in 2000 and \$14,186 in 1980. Given, the significance of mortgage payments as a share of the total housing costs, it is not surprising that housing costs and mortgage payments exhibited the same cyclical pattern. For example, the annual housing costs increased from \$13,344 in 1980 to peak at \$16,245 in 1983 and declined to \$11,924 in 1986.

5.5 Required Annual Income

Canada Mortgage and Housing Corporation (CMHC) has established an affordability threshold for affordable home ownership at 32 percent of gross annual household income. The study therefore uses this standard to estimate the income that is required to purchase the average resale home.

The required annual income was estimated at \$41,299 in 2000 and \$44,332 in 1980. During the 1980 to 2000 period, the income that is required to purchase a house fluctuated directly with the price of the house. Like the price of the house, the required income peaked at \$52,912 in 1983 and declined to \$39,983 by 1986 (Figure 11).

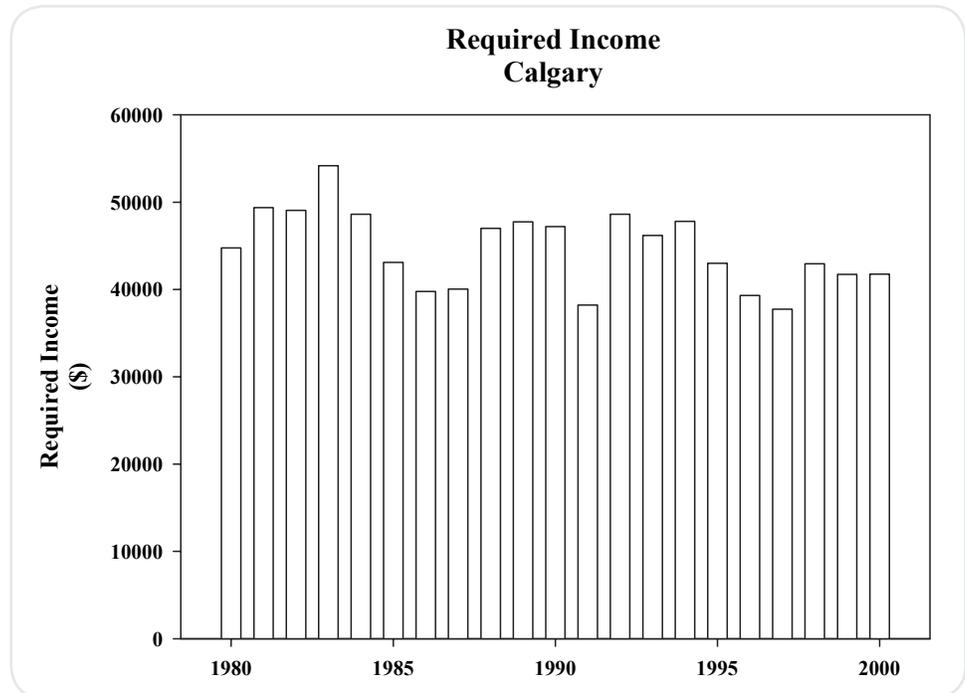


Figure 11: Required Income

The “median income/required income” ratio was estimated to provide a measure of the relative ease of purchasing a house over time. Two points are worth noting about this statistic. First, a ratio that is equal to or greater than one indicates an ability to meet or exceed the requirements to purchase a house and a ratio less than one indicates the opposite. Second, a change in the ratio over time provides an estimate of the changes in the ability to purchase a house over time.

Between 1985 and 1987, the “median income/required income” ratio was estimated at one or slightly above. This indicated that housing was relatively affordable. Between 1988 and 1996, the “median income/required income” ratio was estimated at less than one. Housing affordability therefore worsened in this period compared to the 1985 to 1987 period. The deterioration in the housing affordability was explained by the decline in the real median income over the 1988 to 1998 period. For example, real median income was estimated at \$46,386 in 1988 and fell, with some fluctuation, to \$36,618 in 1996. In 1997, 1999 and 2000, the ratio was estimated above one and this resulted from the growth in inflation adjusted income. Therefore, in recent years housing affordability showed some relative improvement.

5.6. Qualification for Affordable Housing

Our estimates show that in 2000, 56.2 percent of Calgary household could afford the average price for a resale house, down from 60.8 percent in 1980. The data over the study period fluctuated between a high of 60.8 percent in 1980 and a low of 36.7 percent in 1992.

Looking at this data differently, it indicates that a significant percentage of Calgary’s households were unable to afford resale housing. For example, in 1980, 39.2 percent and in 2000, 43.8 percent of all households were unable to afford resale housing. The number of households who could not qualify for resale housing was estimated at 145,530 in 2000, up from 79,216 in 2000. The peak in the number of households that could not afford a house occurred in 1993 at 173,550. This corresponds with the year in which the median income/required income ratio was at its lowest 0.68. The implication is that income growth fell behind the growth in house prices. The late 1990s showed some improvement in income growth relative to house price growth and therefore, the number of families not qualified to afford a house fell.

The above estimates appear to overstate the need for affordable housing, given the observations from both the Federal and Civic censuses that about 70 percent of households in Calgary own their own homes. The adjusted data therefore shows that 43,600 households were in need of affordable housing in 2000, up from 23,700 in 1980.⁶ The average number of households requiring affordable housing was 41,100 over the period 1980 to 2000. This study’s estimates show that 56.2 percent of Calgary’s households were able to qualify for the average house price. This is less than the 70 percent of Calgary’s households who own their own home. It can be inferred that a significant number of Calgarians who own their own homes could not qualify for their homes if they had to do it at today’s prices.

6 The above estimates appear to overstate the need for affordable housing, given the observation that 70 percent of households own their own homes. The study therefore assumes that only 30 percent of households are non-home owners. The percentage of households who could not qualify at the average price was therefore adjusted by 30 percent to arrive at the estimate for the demand for affordable housing.

5.7 Estimated Demand for Affordable Housing

This section presents results for the estimated demand for affordable housing. These results are illustrated by focusing on the period 1996 to 2000⁷ and showing how changes to the real house price, the real mortgage rate and the real median income affected the demand for affordable housing.

7 This period coincides with the period of strong economic growth. During this period, house prices rose sharply and as a result, housing affordability became an issue.

The demand for affordable housing for the period 1980 to 2000 was estimated using the following equation:

$$\begin{aligned}
 \text{DAH} &= 0.384 * \text{RHP} + 3331 * \text{RMR} - 1.05 * \text{MI} \\
 &\quad (5.31) \quad (4.92) \quad (-3.28) \\
 \text{Adjusted R}^2 &= 0.98
 \end{aligned}$$

Figure 12: Demand for Affordable Housing Estimated Equation 1980–2000

DAH = Demand for Affordable Housing
 RHP = Inflation Adjusted Home Price
 RMR = Inflation Adjusted Mortgage Rate
 MI = Real Median Income

The equation shows that 98 percent of the changes in the demand for affordable housing (DAH) is explained by the combination of the changes to real house price, real mortgage rate and real median income. The terms in brackets are the t-values and these show that all the estimated values are statistically significant at a 95 percent confidence interval. In addition, the estimated sign on each of the coefficients is in keeping with prior expectations.

The estimated value on the real house price variable was 0.384. This indicated that an increase in the real house price by \$1,000 may result in an increase in the number of households requiring affordable housing by 384. The real house price increased between 1996 and 2000 from \$148,357 to \$176,151, up by \$27,794 (all in 2000 dollars). This increase in price resulted in an increase in the demand for affordable housing by 10,670 households.

The estimated coefficient on the real mortgage rate was 3330. This implied that a 1 percent point increase in the mortgage rate resulted in an increase in the demand for affordable housing by 3,330. The data for the 1996 to 2000 period showed the real mortgage rate falling from 5.83 percent in 1996 to 4.51 percent in 2000. The reduction in the mortgage rate by 1.33 percentage points is estimated to have caused the demand for affordable housing to fall by about 4,439 households.

The estimated parameter on the median income was -1.05. This implied that an increase in the real median income by \$1,000 resulted in a reduction in the number of households requiring affordable housing by 1,050. The increase in the median income from \$36,618 in 1996 to \$45,852 in 2000 or by \$9,234 would have reduced the demand for affordable housing by 9,696 households.

The effects of increased house prices (10,670), reduced mortgage rates (-4,439) and increased median income (-9,696) combined to reduce the demand for affordable housing by about 3,465 households. The analysis has illustrated that housing affordability improved over the 1996 to 2000 period, despite rising house prices. The improved affordability resulted from the combined effects of reduced mortgage rates and increased real household incomes.

6.0 Conclusion

The average numbers of households in the home ownership market that required affordable housing during this period was 39,100 households (should report as a percent as well), while in 2000, about 12 percent of all households needed affordable housing.

The analysis shows the number of households requiring affordable housing fluctuated over the period 1980 to 2000 vary with the house price, the mortgage rate and household income.

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Appendix

		Income Distribution Table Calgary - 2000																												
Income Class	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000									
Less than \$5,000 (including loss)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0									
\$5,000-9,999	95.0	92.6	93.3	87.1	86.9	90.6	89.0	89.8	91.4	88.7	89.4	87.6	87.7	84.8	88.9	88.2	89.1	88.1	90.7	89.2	89.6									
\$10,000-14,999	92.3	89.3	90.1	81.0	81.2	85.9	84.2	82.9	86.1	83.8	83.8	80.9	82.2	78.1	83.2	83.7	82.6	83.0	84.8	82.3	84.1									
\$15,000-19,999	88.4	85.3	86.7	75.8	75.2	81.3	78.8	77.2	81.6	78.8	76.6	74.3	76.6	70.3	77.6	77.8	76.8	76.2	78.5	76.9	79.1									
\$20,000-24,999	84.7	81.5	82.6	72.2	69.8	76.7	74.6	71.6	77.3	72.6	70.8	68.6	69.9	64.3	72.5	72.3	71.1	69.6	72.2	71.7	75.6									
\$25,000-29,999	79.5	76.5	78.2	67.2	65.6	71.4	69.9	67.1	71.6	68.2	65.7	63.7	62.8	57.0	66.5	66.8	65.1	64.2	66.2	65.6	69.3									
\$30,000-34,999	71.8	70.5	72.4	61.5	58.5	67.0	65.3	61.7	66.5	63.3	60.0	58.6	56.7	52.6	63.0	60.2	59.7	60.2	61.0	62.0	63.8									
\$35,000-39,999	66.8	64.7	67.4	57.2	53.0	61.6	59.7	55.9	60.9	57.4	54.6	52.4	51.4	47.3	57.2	52.9	51.1	55.0	56.2	57.1	59.8									
\$40,000-44,999	60.8	58.7	62.4	50.1	48.6	55.8	55.7	50.5	56.7	54.0	50.3	46.4	45.1	41.2	52.5	49.3	46.1	50.4	51.1	52.3	56.2									
\$45,000-49,999	56.0	52.7	57.1	46.6	43.1	50.5	49.6	45.2	51.1	48.6	45.5	42.3	39.1	36.7	47.1	45.2	40.7	44.7	45.0	47.2	50.6									
\$50,000-54,999	50.9	49.0	51.5	42.5	37.5	44.0	44.8	40.3	46.6	40.1	40.6	38.1	36.1	33.3	42.4	38.9	37.7	41.3	41.8	43.5	46.3									
\$55,000-59,999	46.9	44.2	46.2	39.1	34.0	39.1	40.2	36.9	41.5	35.4	35.7	34.3	32.1	28.7	37.1	34.0	33.4	37.1	38.3	38.9	40.8									
\$60,000-64,999	39.0	39.1	41.1	34.6	29.8	36.0	35.8	33.2	37.3	32.5	31.1	31.1	28.4	25.2	31.3	28.3	29.1	32.9	34.5	34.2	36.3									
\$65,000-69,999	35.2	34.4	36.3	31.8	25.3	32.1	32.2	27.9	32.5	28.9	28.6	26.9	26.5	21.3	27.3	25.3	23.9	29.1	31.1	31.0	30.9									
\$70,000-74,999	31.2	29.6	32.8	27.9	22.4	28.1	28.5	23.5	28.4	25.2	25.9	23.3	23.8	18.4	24.6	22.6	21.0	25.1	26.8	28.7	27.1									
\$75,000-79,999	27.9	25.6	29.9	24.1	20.1	23.9	24.5	20.4	24.1	21.9	21.9	21.3	20.8	16.1	21.3	20.1	18.2	22.6	24.0	25.6	24.9									
\$80,000-84,999	25.3	22.6	26.1	21.5	17.5	20.7	22.2	17.3	21.2	19.6	19.3	18.9	17.9	13.6	18.9	17.2	14.9	20.5	22.0	23.8	22.5									
\$85,000-89,999	21.4	18.5	22.5	19.8	14.4	18.4	19.0	14.1	18.5	17.0	17.0	17.1	15.8	13.1	16.4	15.0	12.2	17.4	18.7	21.5	21.1									
\$90,000-99,999	19.6	16.4	19.3	16.9	12.8	15.6	16.0	12.5	16.2	13.7	15.1	15.2	13.5	11.0	14.4	13.6	10.2	14.5	15.6	18.6	19.2									
\$100,000-124,999	14.3	12.1	15.0	12.2	10.0	10.7	12.4	10.0	13.0	11.0	10.6	11.7	9.3	8.4	10.8	9.9	9.7	12.8	12.4	15.0	15.6									
\$125,000-149,999	7.4	5.6	5.8	5.8	4.5	5.0	6.7	5.0	6.6	6.1	5.2	5.9	5.5	4.5	4.7	4.2	5.8	8.3	8.4	7.3	9.5									
\$150,000 +	3.8	3.0	2.7	2.6	2.2	2.8	3.4	2.4	3.3	2.9	2.0	3.5	3.3	2.3	2.6	2.0	3.5	4.8	4.1	3.4	6.3									

Source: Statistics Canada

Figure 13: Income Distribution Table Calgary

