

Analysis of Housing Quality in Quebec, Ontario and British Columbia, 1981 - 1991

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Executive Summary

This study is a follow up of the Alberta prototype analysis completed in March 1991 which revealed that the average value of residential investment in constant dollars is indeed an indicator of housing quality. It indicated that the growth recorded between 1981 and 1989 in the current dollar average value of residential investment made in Alberta was attributable to quality improvements in housing.

In this paper, we extended the study to the provinces of Quebec, Ontario and British Columbia for the period of 1981 to 1991. The upward trend recorded during that period in the current dollar average value of residential investment was attributed to an increase in prices for the provinces of Ouebec and Ontario but to an increase in quality for the province of British Columbia. Although the average square footage of houses is usually the predominant quality component, the study showed that in British Columbia the size of houses played a lesser role in the quality improvements. These results were confirmed by other series of residential investment obtained from the New Housing Price Index Survey, the Multiple Listing Service Survey and the National Housing Act Statistics, as well as by *quality characteristics* from the New Housing Price Index Survey and the Household Facilities and Equipment Survey.

Of all sources available, the residential investment series obtained from the work put-inplace patterns is the most complete source of information on housing. Furthermore, the results of this analysis indicate that the average value of residential investment in constant dollars is a good indicator of the variations in housing quality.

1. Introduction

Following a 1992-1993 LTP proposal submitted by the Current Investment Indicators Section, the Economic Statistics Committee decided during its meeting of February 20th, 1992 to provide funding for this project. The proposal recommended the extension of the Alberta prototype analysis to the provinces of Quebec, Ontario and British Columbia.

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2. Objectives

The main objective of this study is to produce a new housing quality index by provi The analysis revealed that the constant dollar residential investment series is in fa good indicator of changes in housing quality over time in all four provinces (Quel Ontario, Alberta and British Columbia).

Subsequently to the analysis of the remaining provinces, the Current Investme Indicators Section intends to produce an annual index of housing quality by province This index will be calculated from the residential investment data produced by to Investment and Capital Stock Division and from the New Housing Price Index of Price Division.

Two major benefits will arise from this new housing quality index. First, the index will provide a mean of separating price movements and quality changes in the current dollar residential investment series and second, it will help to assess the reliability of residential investment data provided to the National Accounts in constant dollars.





3. Selected Economic Indicators and Their Impact on the Housing Sector

The purpose of this section is to present an overview of the economic climate that prevailed in the provinces of Quebec, Ontario and British Columbia during the period of 1981 to 1991. The three provinces experienced the same difficulties during the recessions of 1982 and 1991 (see the following charts). The unemployment rate increased dramatically and the Gross Domestic Product per Person as well as the Personal Disposable Income per Person declined significantly. However, Ontario's Personal Disposable Income, contrary to the general trend, grew by 0.1% during the 1982 recession. The preliminary analysis of the four sources of residential investment indicated that during both recessions, the level of prices tended to increase in Quebec and to decline in British Columbia. Furthermore, quality in housing was down in Quebec and up in British Columbia.

In Ontario, the level of prices and the quality of housing behaved differently in each recession. In 1982, the level of prices tended to increase and the quality to decline. On the other hand, the 1991 recession was marked with a substantial decrease in price and an equally strong increase in quality.



The province of Quebec reported a negative net migration¹ of population for the first four years of the study period. It became positive only in 1985 and increased on average by 60.5% per year for the rest of the period.

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¹ Net migration =

Number of immigrants - Number of emigrants + Net interprovincial migrants



On the other hand, British Columbia recorded a positive net migration of population for the full period. From 1981 to 1985, the net migration of population declined on average by 29.3% per year. After 1985, the average annual rate of growth jumped to +267.4%. The period of 1981 to 1985 was not favourable for neither Quebec nor British Columbia in terms of housing demand from newcomers.

The province of Ontario, as in the case of British Columbia, recorded a positive net migration of population for the entire review period. Furthermore, the average annual growth also remained positive from 1981 to 1988. However, after 1988, the average annual net migration rate fell by 3.1% on average for the remainder of the study period. During that period, the average annual rate progressed by 12.8% yearly.

Mortgage rates have been higher than 18.0% during 1981 and 1982 and fell afterwards to an annual average of 12.2%. The lowest rates were recorded in 1987 and 1991 at 11.1%.



The apartment vacancy rate in Quebec remained relatively constant between 1981 and 1986 at an average of 2.2%. After 1986, it skyrocketed toward a level of 6.7% reached in 1991. This represents an annual average increase of 31.2%.

Unlike the province of Quebec, British Columbia's apartment vacancy rate increased on average by 301.8% per year from 1981 to 1985 when it reached 2.5%. Afterwards, it fell until 1989 to stabilized at 0.5%, then came back up again to the 2% level in 1991.



Ontario was found to have the most stable vacancy rate (at 0.9%) for the entire study period. During the 1981 to 1987 period in particular, we note a slight decline in the annual vacancy rate of 0.9% on average. Afterwards, it climbed back until 1991 where it reached 1.9%.

The Gross Domestic Product per Person (GDPP) increased for most of the decade but declined during both recessions. On average, Ontario GDPP was \$3,885 higher than in Quebec and \$1,358 higher than in British Columbia. In 1989, the GDPP reached its peak for three provinces with (\$24,850) in Ontario, (\$22,453) in British Columbia and (\$19,914) in Quebec.



Gross Domestic Product per Person In 1986 Prices

The Personal Disposable Income per Person (PDIP) followed the same trend as the GDPP. That is, a declining period in 1982-1983 and an upward trend which lasted until 1989. However, the province of Ontario took exception to this trend with increases in the Personal Disposal Income per Person in 1982 and 1983 of $\pm 0.1\%$ and $\pm 0.2\%$ respectively. After 1989, British Columbia

and Quebec recorded on average a 2.1% decline per year in the PDIP while Ontario showed -3.1% per year. The gap in PDIP between Ontario and Quebec (\$2,300) or British Columbia (\$580) is notably less important when compared to the GDPP.

Ontario produced on average \$3,885 more in goods and services than Quebec and \$1,358 more than British Columbia during the study period. However, Ontario showed a PDIP only \$2,300 higher than the one in Quebec and \$580 than in British Columbia. The difference of \$1,585 (\$3,885-\$2,300) with Quebec and \$778 (\$1,358-\$580) with British Columbia may be explained by the higher cost of living in Ontario.

The unemployment rate in Quebec reached a peak of 13.9% in 1983 and declined by an average of 6.5% per year until 1989 (9.3%). After 1989, the unemployment rate started to increase toward a rate of 12.0% reached in 1991.



The unemployment rate in British

Columbia lagged by one year the rate in Quebec, but followed the same pattern. With a high level of unemployed, the housing demand remained weak for the first half of the study period.

The unemployment rate in Ontario also peaked in 1983 at 10.4% and then declined by an average of 13.6% per year until 1988. After 1988, the unemployment rate started to escalate until 1991 where it reached 9.6%.

Province of Ouebec

The number of WPIP dwelling units in the province of Quebec increased on average by 30.3% per year between 1982 and 1987 but declined on average by 11.5% per year for the remaining period. The movements in the number of WPIP dwelling units can be explained using the economic indicators previously presented. In 1983, the negative net migration started to decline toward a positive level, mortgage rates fell from 18.04% to



13.23%, the GDPP began seven consecutive years of growth and the unemployment rate stabilized at 13.9% and fell for the following six years. From 1983 to 1986, the apartment vacancy rate declined by an average of 14.5% per year due to an increase in the demand of residential dwellings. After 1987, the number of WPIP dwelling units declined during the next four years. Mortgage rates

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concluded their downward trend in 1987 and increased during the following three years. The apartment vacancy rate exploded in 1987 and kept increasing toward a rate of 6.7% in 1991. The GDPP stabilized in 1989 and declined in 1990 and 1991, and the unemployment rate ended its downward trend in 1989 and increased substantially in 1990 and 1991.

Province of Ontario

The number of WPIP dwelling units in Ontario increased by 21.0% on average per year between 1982 and 1987. After 1987, it decreased by 15.0% on average per year until 1991. The variations in the number of WPIP dwelling units observed during that period can be explained through the examination of the following various economic indicators. Between 1982 and 1987, the net migration figures rose by 14.0% on average each year, while the mortgage interest rates were declining by an average of 8.5% per year. In 1983, Ontario's GDPP and PDIP started also seven years of _

consecutive growth. During the 1983 to 1988 period, the unemployment rate showed a downward trend at an annual average rate of -13.6%. Furthermore, the apartments vacancy rate declined by 7.0% on average per year between 1983 and 1987 due mainly to an upward demand in the housing sector. From 1987 on, the housing demand weakened substantially. The ascending interest rate on mortgage loans over the next three years, the tendency toward higher dwelling vacancy rates (+44.0% average annual change) until 1991, the declining Gross Domestic Product since 1989 and a rising unemployment rate from 1988 on (+2.6% annual average change) were all factors that help explained the housing sector economic downturn.

Province of British Columbia

The number of WPIP dwelling units in British Columbia fell on average by 18.6% per year until 1985 and then increased by 18.3% per year until 1990. The demand for residential dwellings in British Columbia was highly related to the net migration figures, since both series followed the same pattern at relatively the same levels. The apartment vacancy rate increased annually by an average of 301.8% between 1981 and 1985. These large increases came from a weaker demand for residential dwellings. In the same period, the unemployment rate reached very high levels (14.7% in 1984). From 1981 to 1985, the PDIP declined on average by 1.0% per year. This may partially explain the weaker demand recorded in the housing sector during that period.

- 4. Methodology Concepts
- 4.1 Description of Different Statistical Series Used to Identify Quality Movements in Housing
 - 4.1.1 Work Put-in-Place (WPIP) Patterns New Residential Investment

The Current Investment Indicators Section uses work put-in-place (WPIP) patterns in order to produce a residential investment series. The following chart summarizes the monthly calculation of new residential investment.





Building permits are the basis of the new residential investment calculation. The Canada Mortgage and Housing Corporation (CMHC) uses the construction site address that appears on building permits to identify the number of starts. Since the CMHC does not calculate any dollar values, building permits are used to attribute a value to the starts. However, the Current Investment Indicators Section modifies the value of building permits with blow-up factors in order to eliminate any underestimation. These adjustment factors were originally calculated by comparing the value of dwellings financed under the National Housing Act (NHA) with the value indicated on building permits. The adjusted average value of building permits is distributed over a period of six months. We assume that the building permit issued at time (t) will show up eventually in the starts of time (t) to (t+5). The average cost of starts is calculated from this distribution.

From the start and completion dates, we are able to calculate the construction duration (up to 21 months). The construction duration is updated annually from the information gathered by CMHC inspectors. The work put-in-place monthly progress was calculated from a sample of dwellings financed under the NHA between 1971 to 1978. During that period, CMHC inspectors had to estimate the construction progress in order to release the required funds. The merging of the construction duration and the work put-in-place monthly progress results in the creation of work put-in-place coefficients.

Those work put-in-place coefficients are then applied to the number and the average cost of starts in order to produce a new residential investment series in terms of units and dollar values. It is important to understand that this new residential investment series is the result of a complex calculation and, therefore, is not an observable variable. Generally speaking, it is an estimate of the construction activity level in dollars and units for a specific period.

Residential investment figures are calculated for all four types of dwellings (singles, doubles, rows and apartments). In Quebec, Ontario and British Columbia, single and

apartment dwellings accounted for more than 85.0% of the total between 1981 and 1991. Single dwellings alone represented 46.0% of the total in Quebec, 55.0% in British Columbia and 59.0% in Ontario, which represents approximately the same proportions as in the existing housing stock.



Residential investment from the WPIP patterns represents the value of new constructions of all municipalities issuing building permits in Canada. Therefore, WPIP figures are the most complete source of new construction activities in the residential sector. Constant dollar figures are calculated by dividing the current dollar investment series by the Prices Division house-only index as modified by the National Accounts in order to get a provincial price index.

4.1.2 New Housing Price Index (NHPI) Survey New Residential Investment

The New Housing Price Index is a monthly survey of contractors' selling prices for new residential dwellings. This index measures changes that occur in the selling price of a model house with quality characteristics remaining constant through time for single, double and row dwellings. The survey is conducted in the major metropolitan areas of each province. In Quebec those metropolitan areas are the cities of Montreal and Quebec, in Ontario, the cities of Ottawa and Toronto and in British Columbia, the cities of Vancouver and Victoria.

In the province of Quebec, single dwellings represented approximately 75.0% of the total between 1981 and 1991. However, in British Columbia they accounted for about 90.0% of all dwellings at the beginning of the period and that proportion declined afterwards to about 55.0%. In the province of Ontario, single dwellings accounted for 92.0% of all dwellings.

As opposed to the residential WPIP investment figures which include all municipalities, the NHPI investment figures include only the major metropolitan areas. Furthermore, the share of the market occupied by single dwellings is by far to important to represent the existing housing stock. In the NHPI survey, the value of residential dwellings built by contractors represents only a small share of the total value of building permits issued in Canada. However, the NHPI survey indicates the average square footage of houses, which is the major component of quality movements in housing. In this paper, we will use both the house and house+land indexes produced by Prices Division to deflate the current dollar figures obtained from our four statistical series.

4.1.3 <u>National Housing Act (NHA) Statistics</u> New Residential Investment

The Canada Mortgage and Housing Corporation (CMHC) gathers the value of new houses financed under the National Housing Act (NHA). This residential investment includes all four types of dwellings in proportions similar to the ones found in the NHPI survey. Single dwellings account for more than 80.0% of the total in the province of Quebec and Ontario and over 95.0% in British Columbia. Given this large proportion of single dwellings, NHA figures do not represent adequately the existing housing stock. Furthermore, houses covered in this survey tend to be of lesser value and are concentrated in major metropolitan areas. One can agree that the National Housing Act was established to increase the availability of affordable housing in Canada. With information on the average square footage of houses, the NHA survey becomes very useful to analyze quality improvements. The constant dollar investment figures for NHA statistics are calculated with the Prices Division house+land index.



4.1.4 <u>Multiple Listing Service (MLS) Survey</u> Residential Investment

The residential investment from the MLS survey includes both the house and land cost. This survey is conducted by the Canadian Real Estate Association and is aimed at the resale market of single, double, row and apartment dwellings. Therefore, newly constructed houses and old buildings are all included in the survey. With no information on the share occupied by each dwelling type, we can assume that single dwellings account for about 44.0% of the total in Quebec, 64.0% in British Columbia and 57.0% in Ontario. This is approximately their relative share in the existing housing stock. Similarly to the NHPI survey and the NHA statistics, the MLS survey covers only the major metropolitan areas. Since the MLS data includes both the house and land cost, we will be using the Prices Division house + land index to calculate its constant dollar series. The Household Facilities and Equipment survey indicates that the average house in the existing housing stock was built at the beginning of the 1960's in Quebec, Ontario and British Columbia. Therefore, we can assume that the majority of houses in the MLS survey were built during the same period.



4.2 Concept of Housing Quality

From the Statistics Canada Building and Demolition Permits survey and the CMHC's Starts and Completions survey, the Current Investment Indicators Section produces a monthly series on the number of dwellings put-in-place and the corresponding value of work put-in-place (WPIP). The value of work put-in-place represents the flow of money required during the construction of residential dwellings. When multiplied by the number of dwellings put-in-place, this flow of money is called total residential investment and is added to the housing stock series. The total value of residential investment is the basis of the Housing Quality Analysis study.

The goal of this study is to promote the use of residential investment as an indicator of quality movements in the housing sector. In order to do so, we need to eliminate the effects of the number of dwellings on the investment series. Therefore, only the average value of investment will be used to study the movements of quality in housing.



I = N * VAVI = (N * V) / N ==> AVI = V

Where,

I is the total value of investment N is the number of dwellings put-in-place V is the value of the work put-in-place AVI is the average value of investment

Therefore, the average value of investment (AVI) is equal to the value of the work putin-place (V), which is the average cost of residential dwellings.



By eliminating the quantity variable (N), we can explain the movements in the average value of investment with the help of two components:

- i) Changes in the quality characteristics of houses (**A** Q)
- ii) Inflation in the housing sector $(\land P)$

Thus, an increase in the AVI may come from either an increase in the amount of quality characteristics of houses or an increase in residential prices (or both).

AVI = AQ + AP

Where,

AVI is the Total Change

- ▲ Q is the Quality Change
- ▲ P is the Price Change.

However, this relation may not always be true since the Quality Change component is a residual.

The Total Change series is defined as the variation in the AVI in current dollars unadjusted for price or quality changes, while the Quality Change component represents the variation in the AVI in constant dollars adjusted for price changes. Furthermore, the *Price Change* component is the variation in the AVI in current dollars with quality fixed at the 1986 level. We have maintained the AVI in current dollars at the 1986 level and have multiplied it by the deflator.



Throughout this paper, we will use the New Housing Price Index to calculate the constant dollar series. The WPIP series is deflated using the house-only NHPI which is weighted by the National Accounts with building completion values in order to get a provincial index. In the case of the NHPI series, we will use the house-only NHPI. Due to the inclusion of land cost in the NHA and MLS series values, the house+land NHPI will replace the house-only index. In all three sources (NHPI, NHA and MLS), the provincial index has been calculated from the weights of cities included in the NHPI survey.

Since the NHPI measures only the real price movements of a model house through time, variations in the AVI in constant dollars are bound to reflect quality changes in residential construction. Therefore, changes in variables such as floor area, model substitution, special characteristics and quality of construction materials as well as labour inputs have no impact on the NHPL.

Once the effects of inflation on the average value of residential investment are eliminated, we can impute the remaining variations to quality changes. The housing quality component of the series will either increase or decrease depending on the movements recorded in the following variables.

- Bigger homes,
- a shift in consumer demand from row housing to single dwellings,
- the presence of special characteristics like fireplaces, garages and luxurious construction materials (marble floors and custom design windows) and finally,
- the use of more custom work are all defined by an increase in quality.

As previously mentioned, the NHPI measures the movements in the price of a model house through time. The model house is the most common house (of equal quality) built by builders, in the survey sample, during the base year. Sometimes a builder stops to built the model house and changes to an upgraded house with extra quality. For that builder to remain in the survey sample, Prices Division needs to remove that extra quality. To clearly explain that process, we have used an example taken from the working paper New Housing Price Indexes. 1981=100.

Time	Reported Price ²	Quality Change ³	Updated Base Price ⁴	Price Index ⁵
t	P _{ijk(t)}	▲ ijk(t)	P ^o _{ijk(t)}	I _{ijk(t)}
0	90,000	-	90,000	100.00
1	100.000	-	90,000	111.11
2	125,500	500	90,360	138.89
2	139 425	1,375	91,260	152.78
3	136 675	-2.750	89,460	152.78
	100 340	-	89,460	122.20
5	116.655	1,848	90,900	128.33

The reported price of the model house at time t=0 was \$90,000. At time t=1 the

- 2 Reported price before the adjustment for quality change.
- 3 Quality change in dollars.
- Estimated price of the k^{th} model of the j^{th} builder in the i^{th} city assuming that the house quality at that time was the same as the quality actually observed for the current t^{th} month.
- s Quality adjusted price index for the kth model.

quality component of the model house remained constant, therefore, the base price remained at \$90,000 and the price index increased to 111.11 (\$100,000/\$90,000). The quality component of the model house increased by \$500 at time t=2, that is a 0.4% increase in quality. In order to keep the quality constant in the price index, we need to recalculate the base price accordingly.

% of variation in quality at $t=2$	x	Base price at t=1	-	Base price at t=2
\$125,500 / (\$125,500 - \$500)	x	\$90,000	-	\$90,360
1.004	x	\$90,000	×	\$90,360

The price index at t=2, with quality constant at the t=0 level, is the ratio between the reported price and the new base price at t=2.

(\$125,500 / \$90,360) = 138.89

At time t=4, the reported price declined by \$2,750 to \$136,675, which corresponds exactly to the quality change reported in that period. Since the decline in the reported price came completely from a drop in quality, the price index remained at 152.78. The reported price dropped 20% at time t=5 from \$136,675 to \$109,340. The quality in houses did not change in that period, therefore the 20% drop in the reported price was entirely attributed to a decline in prices (((122.20 - 152.78)/152.78) * 100 = -20%).



5.

Analysis of the Average Value of Investment as an Indicator of Housing Quality

5.1 Province of Quebec

Work Put-in-Place (WPIP) Patterns

Between 1981 and 1991, the average value of investment (AVI) in residential projects increased on average by 5.8%. The AVI in current dollars was at its lowest level in 1982 with \$49,450 and increased continuously afterwards to reach a maximum of \$88,731 in 1991. The only decline was recorded in 1982 (-3.8%) and was entirely attributable to a drop in quality. Furthermore, this was the strongest drop in quality recorded over the study period. Construction activities were slowing down in 1982 due to the recession; builders were confronted to a 6.7% inflation rate in residential construction and, therefore, reduced the amount of quality characteristics in order to stabilize the costs.

In 1987 and 1988, the AVI in current dollars increased by 19.4% and 14.4% respectively. These increases were equally attributable to both the quality and price components of the series, which both increased by approximately 9% in 1987 and 7% in 1988. The largest increases in the quality and price components were reported during this period.

In 1982, single dwellings reported the largest decline in quality (-11.0%) followed by double (-7.8%) and apartment (-4.0%) dwellings. On the other end, row housing reported a 1.6% increase in quality for 1982. The quality in single dwellings started to increase only in 1984 and continued to increase at a declining rate for most of the decade. The quality component in double dwellings declined or showed very slow increases for most of the 1980's, with the exception of 1989 and 1991 where large

All figures mentioned in this section are presented in appendix.



increases were recorded. Row housing (-7.6%) and apartment dwellings (-15.0%) recorded their largest declines in quality in 1983.

Inflation in residential construction was high throughout the decade (+4.9% on average). Builders adjusted the amount of quality in homes based on the economic situation and the type of dwellings. During an economic slowdown and a period of high inflation, builders removed some quality components in their homes to keep prices at their lowest levels and to sustain the demand.



	Quality Change	Price Change
Total Residential Construction	14%	86%
Single Dwellings	17%	83%
Double Dwellings	7%	93%
Row Housing	24%	76%
Apartments	3%	97%

Components of Total Change in Housing Investment by Type Quebec, 1981-1991

The previous table shows the role played by the quality and price components in the variation of AVI by type of dwelling. Inflation, that is the Price Change, accounted for 86% of the variation in AVI for all residential projects between 1981 and 1991. Consequently, quality improvements represented only 14% of the Total Change. The largest percentages of quality change were recorded in row housing (24%) and single dwellings (17%). As regard to single dwellings, quality improvements in houses occurred mainly between 1984 and 1986, where increases ranged from 4.7% to 6.3%. On the other hand, row housing reported two significant increases in quality in 1988 (+11.6%) and 1990 (+11.2%). The average price increase recorded between 1981 and 1991 for single, double and row dwellings was 5.5%, while that rate fell to 3.6% for apartments.

New Housing Price Index (NHPD) Survey

The average value of investment (AVI), which is the average price of houses included in the NHPI survey, increased by an average of 5.0% per year from 1981 to 1991. The largest increases occurred between 1985 and 1988 and ranged from +8.7% to +26.3%. These large movements were the results of both price and quality increases in the housing sector. The price component increased by 5.6% on average during the study period with increases ranging from +0.3% in 1991 to +13.4% in 1987. Consequently, price movements were entirely responsible for the 5.0% increase showed in the average current dollar investment figures. On the other hand, the average constant dollar value of investment, which represents the quality component of the series, declined by 0.7%on average between 1981 and 1991.







The average constant dollar investment figures were down during both recessions. Since the number of square feet in a house is the most important component of housing quality, a negative Quality Change is usually accompanied by a decline in the average square feet series. The largest drop in the Quality Change occurred in 1983 with a 12.7% decline entirely attributed to a 15.2% drop in the average square footage of houses. The same situation was recorded in 1984 and 1991 when the drop in the AVI in constant dollars came from lower average square footage.

Between 1981 and 1991, the average house built in the province of Quebec showed a decline in quality of 0.7% per year but at the same time its price went up by an average of 5.6% annually. Consequently, we can conclude that on average residential inflation was responsible at 114.3% for the increases recorded in residential investment. The drop of quality in housing came essentially from smaller houses being built during both recessions. In order to sell during a recession, builders sometimes had to reduce the size of their constructions.





National Housing Act (NHA) Statistics

The average value of investment (AVI) for residential dwellings financed under the National Housing Act (NHA) grew on average by 6.4% per year between 1981 and 1991 with a rate of increase ranging from 3.5% to 11.9%. Residential inflation increased by 6.0% per year on average, while the quality of houses was up by only 0.5% per year. As previously confirmed by other sources, price increases were responsible for the upward trend observed in the current dollars series. The average square footage of houses declined on average by 0.4% per year and followed approximately the same trend as the Quality Change series.





Multiple Listing Service (MLS) Survey

The housing quality component of the AVI in the resale residential sector showed large variations in 1982 (-9.2%), 1983 (+6.9%) and 1985 (+5.5%), but remained relatively stable for the rest of the study period with only one decline recorded in 1990 (-2.4%). Residential inflation was positive for the full period with a maximum of +13.9% in 1987 and a minimum of +1.0% in 1991. Due to a drop in residential prices, the growth rate of the AVI in current dollars declined considerably after 1987. The 6.9% average rate of increase recorded in the AVI in current dollars between 1981 and 1991 came mostly from a higher inflation rate (+6.0% on average) in the residential construction sector. Quality improvements were up by only 0.8% annually on average.



5.2 Province of Ontario

Work Put-In-place (WPIP) Patterns

The average value of investment (AVI) in residential projects increased on average by 7.3% in Ontario during the study period. The AVI in current dollars reached its lowest level in 1982 at \$54,416. The only declines were recorded in the recession years 1982 and 1991. In 1982, the AVI in current dollars decreased 5.3% directly as a result of a drop in quality (-8.7%). In the same year, residential inflation was at 3.7% which may explain why builders lower their construction cost rather than the quality. On the other hand, in 1991, the decline in the AVI (-4.1%) was attributed to the strongest price reduction (-10.6%) recorded in the decade. The plummeting prices in housing recorded in 1991 forced the builders to improve quality (+7.3%) in order to attract new home buyers.

A substantial surge of the AVI in current dollars (+12.6% on average) marked the 1986 to 1989 period. These increases resulted mainly from higher prices (+14.0% on average) in residential construction. The year 1989 was the only time when the increase of the AVI (+17.2%) was equally attributable to the price (+8.1%) and the quality (+8.4%) components. The AVI in current dollars increased by 9.7\% and 12.6\% in 1986 and 1987 respectively due to higher inflation rate (+14.5% and +21.3%). However, the quality of dwellings declined both in 1986 (-4.2%) and in 1987 (-7.2%). This time, the builders counteracted the rising cost due to inflation by reducing the quality of the dwellings to keep prices at their lowest level.

High inflation and important decreases in housing quality at the total residential construction level prevailed during the 1986 to 1989 period. This condition was relatively the same for three types of dwellings. In 1986 particularly, when double dwellings posted their strongest decline in quality (-13.4%), followed by row housings (-11.5%) and single dwellings (-6.7%), the corresponding rate of inflation skyrocketed to





+15.8%, +16.1% and 15.9% respectively. In 1987, when prices soared for row housings (+24.9%), single (+24.8%) and double (+24.5%) dwellings., the quality component recorded substantial decreases of -13.2%, -5.6% and -6.3% respectively.

The rate of inflation in residential construction was at +5.0% on average throughout the decade. Specifically, the average annual rate of inflation was +5.3% for row housings, +5.2% for both single and double dwellings and +4.4% for apartment dwellings. During the 1991 recession the AVI in current dollars declined for each type

of dwelling. These decreases were atributable to a strong deflation in the residential construction during the year. The strongest drop in prices during 1991, occured in row housings (-13.2%) followed by single dwellings (-13.1%), double dwellings (-12.6%) and apartment dwellings (-3.6%).

Components of Total Changes in Housing Investment by Type Ontario, 1981-1991

	Quality Change	Price Change
Total Residential Construction	33%	67%
Single Dwellings	42%	58%
Double Dwellings	0%	100 %
Row Housing	24%	76%
Apartment	3%	97%

Between 1981 and 1991, 67% of the variation in the average value of investment (AVI) for the total residential construction was explained by inflation. Similarly, quality improvements accounted for the remaining 33% of the total (AVI) variation. The type of dwelling for which the rate of inflation affected most the total AVI variation was the double dwellings (100%), next was the apartment dwellings (79%) and the row housings (77%). The single dwelling was the only type of housing for which the quality component (+42%) and the price component (+58%) were equally responsible for the total AVI variation between 1981 and 1991. Actually, quality improvements played a major role in single dwellings and were particularly noticeable in 1984 (+13.3%) and during the 1989 to 1991 period (10.7% on average). Quality was also the cause of two important increases in the AVI during 1990 and 1991 for row housings (+16.0% and +10.6%) as well as for double dwellings (+10.2% and +13.9%).



New Housing Price Index (NHPD Survey

In Ontario, the average value of investment based on the NHPI survey increased by 7.7% on average annually between 1981 an 1991. As in Quebec, the strongest increases were recorded between 1985 and 1988 ranging from 9.8% to 29.2%. These changes are not due only to price rises but also to quality improvements in the residential housing sector. Contrary to Quebec, the AVI in current dollars in Ontario also went down on three occasions. Specifically the AVI suffered a 4.6% drop in 1983 due to falling prices (-3.2%) in residential housing and an erosion of quality in dwellings (-1.4%).

The other two declines in 1990 (-5.2%) and 1991 (-9.4%), were both explained by plummeting prices of -6.3% and -15.2% respectively.





The quality component increased annually by 2.4% on average with percentage changes ranging from -7.8% in 1989 to +8.6% in 1986. In general, the annual average increase in quality (+2.4%) was due to increase in square footage in houses (+3.3%) during the entire study period. In 1989, the strongest decline in quality (-7.8%) was accompanied by a corresponding drop in the average square feet series (-0.6%) and a price rise of $\pm 10.4\%$. On the other hand, the price component increased by 5.2% on average over the review period with variations ranging from $\pm 15.2\%$ in 1991 to $\pm 26.6\%$ in 1987. Therefore, we can conclude that on average, residential inflation was responsible at 68% of the increase recorded in residential investment, while the quality component accounted for 32% of the total change.





National Housing Act (NHA) Statistics

In Ontario, the average value of investment (AVI) for residential dwellings financed under the National Housing ACT (NHA) grew on average by 7.7% per year between 1981 and 1991 at a rate of increase ranging from -3.3% to +16.5%. The AVI in current dollars declined only during the two recession years. The decrese in 1982 (-3.4%) was mainly due to a drop in quality (-5.7%) accompanied with a -1.3%decrease in house sizes, while the 1991 decline (-0.6%) was attributed to falling prices (-13.9%). The 1986 to 1989 period was characterized by a strong surge in the AVI (+13.0% on average) due mainly high residential inflation rate (+18.1% on average). The average annual price increase in housing was +6.0% while the quality component grew by 2.4% on average for the entire period. The average square footage of houses climbed by 0.3% on average each year and followed the same trend as the Quality Change series.



Multiple Lising Service (MLS) Survey

In the province of Ontario, the AVI in residential housing according to the multiple listing service survey (MLS), rose 9.9% on average annually between 1981 and 1991. Between 1986 to 1989, the growth rate of the AVI reached high levels (+21.1% on average) due to substantial price increases (+18.1% on average) in the residential construction. In 1982, a decline of -2.5% in the housing quality was responsible for a decrease of -0.1% in the AVI, while in 1991, falling prices caused the AVI to decline by -2.1%. The quality component of the AVI in the resale residential sector grew annually by 4.0% on average throughout the review period. These most important increases occured in 1983 (+10.4%), in 1986 (+10.6%) and 1991 (+14.7%). On the other hand, the price component increased on average by +6.0% each year and generally followed the same trend as in the AVI in current dollars. Therefore, we can trace the average annual variations of the AVI through the Price Change series and the Quality Change series.



Work Put-in-Place (WPIP) Patterns

The average value of investment (AVI) in residential construction has been increasing continuously since 1981 at an average annual rate of 6.1%. Improvements in housing quality (+6.1%) were entirely responsible for the upward trend observed in the current dollars series, while residential inflation (+0.4%) was essentially non-existent on average. The only decline in quality occurred in 1987 (-2.3%) and was responsible for the smallest increase of the decade in the AVI (+1.6%). On average, during the 1980's, home builders in British Columbia continuously built improved houses in an economic climate characterized by little inflation. The inflation described in this study covers only the building part of residential construction. Actually, residential inflation was higher in the land component, but followed the same pattern as for building prices.



Large increases in quality were recorded in 1982 (+19.1%) and 1991 (+15.8%). The falling prices recorded during those two years (-13.7% for 1982 and -6.8% for 1991)



forced the builders to increase quality in order to attract new home buyers.

All four types of dwellings reported large increases in quality for 1982 and 1991, with the exception of double dwellings which reported a 4.7% drop in quality for 1991. However, double dwellings had reported a 16.4% increase in quality the previous year. Furthermore, the largest variations in quality were observed in double dwellings with a 44.2% increase in 1982 and a 11.8% decline in 1987. That type of dwelling has the smallest number of dwelling units, consequently, this might explain why builders have to make stronger adjustments in order to sell.

	Quality Change	Price Change
Total Residential Construction	94 %	6%
Single Dwellings	106%	-6%
Double Dwellings	107 %	-7%
Row Housing	104 %	-4%
Apartments	68 %	32 %

Components of Total Change in Housing Investment by Type British Columbia, 1981-1991

Contrary to the situation in Quebec, quality improvements accounted for 94% of the variation in the AVI in British Columbia while inflation represented only 6% of the Total Change. Actually, deflation is the term we should be using to explain the movements in prices. On average, the building segment of residential inflation for single, double and row dwellings was negative between 1981 and 1991. However, the Price Change component for apartments accounted for 32% of the variation in AVI. Even though they have less potential for quality change, quality improvements observed in apartment dwellings for British Columbia did represent 68% of the Total Change in the AVI. Condominium apartments account for approximately 32% of total apartment dwellings built in British Columbia. Consequently, it is not surprising to observe large increases of quality in apartments.



New Housing Price Index (NHPD) Survey

The average value of investment (AVI) in British Columbia increased on average by 7.0% per year between 1981 and 1991. Although the AVI in current dollars increased for most of the period, three declines were recorded. The 1982 decline (-17.3%) was entirely due to a drop in residential prices (-18.6%), while the decline of 1983 (-12.7%) came from a drop in housing quality (-15.1%). The third decline (-1.2%) occurred in 1988 and was again attributable to a drop in housing quality (-6.2%).



The quality component of the series increased by an annual average of 7.1%, while the price component recorded a slight decline of 0.3%. Therefore, contrary to the province of Quebec and Ontario, the upward trend in the average value of residential investment in current dollars was solely the result of quality improvements in the British Columbia housing sector. In 1982, inflation in the residential sector decreased by 18.6% due to the economic climate. The following year, housing demand was still weak, therefore, builders removed some quality characteristics in houses (-15.1%). Due to the relatively strong economy in British Columbia, quality may still continue to increase in 1992, even



though prices were down in 1991.







National Housing Act (NHA) Statistics

The British Columbia AVI for NHA financed homes increased on average by 5.2% per year during the study period. Although the growth rate remained relatively constant at the 5.0% level, large movements were recorded at the end of the study period which were entirely due to housing quality. The 13.6% drop in the current dollar AVI observed in 1989 came from a 24.8% decline in quality while the 18.3% increase recorded in 1991 was again attributable to quality improvements (+26.5%). The quality of houses was up on average by 6.9% per year but was not necessarily linked to larger buildings since the average square footage of houses increased only by 0.9% per year on average during the full study period. Residential inflation remained negative for the first half of the 1980's. Between 1981 and 1991, prices were down on average by 0.5% per year.



Multiple Listing Service (MLS) Survey

The average value of residential investment gathered from the MLS survey in British Columbia increased on average by 4.4% per year between 1981 and 1991. In 1982, a drop in prices (-19.7%) contributed to the 20.1% decline recorded in the AVI in current dollars. The AVI in current dollars increased considerably in 1988 (+18.8%) and 1989 (+25.1%). Both the Quality Change and Price Change series were responsible for these large increases. However, quality improvements played a more significant role in 1988 and inflation was the key component in 1989. With quality improvements increasing at an average rate of 4.8% annually between 1981 and 1991, housing quality was entirely responsible for the upward trend observed in the AVI in current dollars. With regard to inflation, the Price Change series declined on average by 0.5% per year during the study period.



Province of Quebec

All investment series supported the results obtained from the WPIP investment figures. The split of the Total Change series into its quality and price components provided us with impressive results for all four sources of residential investment. The growth in the current dollar AVI recorded between 1981 and 1991 for the WPIP investment figures was mostly attributed to residential inflation (86.0%), while quality improvements accounted for only 14.0% of that growth. The analysis of NHA and MLS figures led to similar conclusions. However, the NHPI investment series showed a negative contribution of the quality component to the Total Change series. The drop in housing quality in the NHPI survey occurred only during both recessions. Since builders included in the NHPI survey are the most active contractors in each metropolitan areas, they reacted more severely by reducing the quality of residential dwellings in order to keep their sales level.

Components of Total Change⁷ in Housing Investment Quebec 1981-1991

and the second	Quality Change	Price Change
WPIP Patterns	14.0%	86.0%
NHPI Survey	-14.3%	114.3%
NHA Financed Homes	7.7%	92.3%
MLS Survey	11.8%	88.2%



⁷ The Total Change series represents the annual variation in percentage of the average value of investment in current dollars. As mentioned earlier, the Total Change series is divided into its quality and price components.

Province of Ontario



As in the province of Quebec, all the investment series confirmed the results derived from the WPIP investment figures. The growth in the current dollar AVI recorded between 1981 and 1991 for the WPIP investment figures was due mainly to residential inflation (67.0%) but also to quality improvements (33.0%). The analysis of the other three investment series led to similar results. The detailed analysis of the current dollar AVI Total Change series according to its quality and price components have provided remarkable conciliatory results from the four investment series.

Components of Total Change in Housing Investment Ontario 1981-1991

	Quality Change	Price Change
WPIP Patterns	33.0%	67.0%
NHPI Survey	32.0%	68.0%
NHA Financed Homes	29.0%	71.0%
MLS Survey	40.0%	60.0%





Province of British Columbia

The analysis of WPIP investment figures revealed that quality improvements accounted for 93.8% of the growth in the AVI in current dollars between 1981 and 1991. Furthermore, WPIP investment figures showed the only positive contribution of the Price Change component (+6.2%) to the Total Change series, whereas NHPI (-4.4%), NHA (-8.0%) and MLS (-11.6%) data reported a negative contribution of residential inflation. This disparity is explained by the presence of apartment dwellings (30.2% of the total) in the WPIP investment figures. The average annual growth rate of prices in apartment dwellings between 1981 and 1991 was +2.1%. Consequently, the Price Change for all four types of dwellings in WPIP figures was on average +0.4% per year. This differs from the average annual declines recorded in the House-only NHPI (-0.3%) and in the House+land NHPI (-0.5%), which are used to deflate the NHPI, NHA and MLS investment series.

Components of Total Change in Housing Investment British Columbia 1981-1991

	Quality Change	Price Change ⁸
WPIP Patterns	93.8%	6.2%
NHPI Survey	104.4%	-4.4%
NHA Financed Homes	108.0%	-8.0%
MLS Survey	111.6%	-11.6%



^{*} A negative Price Change component (deflation) indicates that quality was on average the only factor contributing to the upward trend recorded in the average value of investment in current dollars.

6. Microeconomic Indicators of Quality Movements in Housing?

In the previous sections, we compared the AVI in constant dollars from the WPIP investment series with other average costs series gathered from the NHPI and MLS surveys and the NHA statistics. The results of this analysis have reinforced the concept that constant dollar residential investment is a good indicator of quality change in housing.

In order to support those results, we introduce in this section other sources of quality indicators available from the NHPI survey and the Household Facilities and Equipment survey.

6.1 A New Quality Composite Index from the NHPI Survey

Prices Division provided us with average square feet data and microeconomic indicators of quality movements in housing such as the average number of bedrooms, garages, bathrooms and fireplaces. Even though these indicators are calculated from a relatively small sample of builders in major metropolitan areas, they still represent a reliable source of housing characteristics for new constructions. In an attempt to simplify the analysis of the microeconomic quality indicators, we calculated their relative weight and produced a composite index with 1986 as the base year. To obtain the proper weights, we identified the construction costs of each variables from an American source. Despite the fact that the construction costs are in U.S. dollars, they represent a good estimate of their relative share.

Province of Quebec

The average square footage of houses in Quebec increased on average by only 0.2% per year between 1981 and 1991. This weak performance is due to the annual average declines of 1.0% in the number of bedrooms and 0.6% in the number of bathrooms

* All figures mentioned in this section are presented in appendix.



observed during the study period. However, this drop in quality was partially offset by annual average increases in the number of garages (+11.1%) and fireplaces (+7.6%). Using the construction costs, we estimated the relative weight of each microeconomic quality indicator as follows:

Microeconomic Quality Indicator	Weight
Average Number of Bedrooms	67.6%
Average Number of Garages	16.9%
Average Number of Bathrooms	8.5%
Average Number of Fireplaces	7.0%

The weighting was applied to each variable and the results were based on 1986 in order to obtain a composite index. As expected, the composite index declined on average by 0.8% per year between 1981 and 1991. Moreover, we calculated a quality index for both WPIP and NHPI investment data from their constant dollar AVI series.



All three quality indexes showed approximately the same trend. During both recessions,



they showed a drop in quality with the exception of the WPIP quality index which continued to increase in 1990 and 1991. In the WPIP investment series, quality increases were recorded in double, row and apartment dwellings which represent 53.6% of the total. The downward trend in the last recession in both the NHPI and NHPI Composite Index can be attributed to two factors. First, the NHPI survey is aimed at major contractors in metropolitan areas and during the last recession, they were forced to remove some quality in their constructions in order to keep their sales level. Second, the NHPI survey covers mainly single dwellings and the WPIP investment series indicated that this type of dwelling reported a drop in quality in 1990 and 1991.

Province of Ontario

The average square footage in Ontario houses increased on average by 3.3% annually between 1981 and 1991. This growth is attributed to an annual average increase of 1.3% in the number of bedrooms, of 1.6% in bathrooms, of 1.5% in garages and of 3.4% in fireplaces during the same period. The Ontario NHPI composite indes was calculated with different weights than the ones used in Quebec as well as in British Columbia. These differences stem from the larger size of dwellings in Ontario (2,100 square feet) compared to British Columbia (1,850 square feet) and Quebec (1,300 square feet).

Microeconomic Quality Indicator	Weight
Average Number of Bedrooms	74.1%
Average Number of Garages	13.5%
Average Number of Bathrooms	6.8%
Average Number of Fireplaces	5.6%





The NHPI composite index was derived through the weighting of each variable with 1986 as the base year. Between 1981 and 1991, the NHPI composite index grew on average by 1.4% in Ontario. On the other hand, the WPIP and NHPI quality indexes increased on average by 2.5% and 2.4% respectively.

Generally, the three quality indexes tended to increase in Ontario for the study period. Moreover, it was noted that the annual average increase of 2.4% in housing quality calculated from the NHPI was accompanied by an annual average rise of 3.3% in the average square footage of houses. Consequently, the average annual increase reported by the three quality indexes between 1981 and 1991 originated from the larger size of dwellings. The latter is due to average annual increase of : 1.3% in bedrooms, 1.6% in bathrooms, 1.5% in garages and 3.4% in fireplaces.



Province of British Columbia

From the NHPI investment analysis, we found that quality improvements were up on average by 7.1% per year between 1981 and 1991, but the average square footage of houses increased only by an average of 2.3% per year during the same period. This was due to an average decline of 0.5% per year in the average number of bedrooms. With regard to the other microeconomic quality indicators, the average number of garages (+3.6%), bathrooms (+1.0%) and fireplaces (+4.4%) reported, on average, annual increases between 1981 and 1991.

The British Columbia NHPI Composite Index was calculated with different weights than the ones used in Quebec. The weight assigned to the average number of bedrooms in British Columbia is more important because of the larger size of dwellings in that province (1,850 s.f. compared to 1,300 s.f. in Quebec).

Microeconomic Quality Indicator	Weight
Average Number of Bedrooms	72.7%
Average Number of Garages	14.3%
Average Number of Bathrooms	7.1%
Average Number of Fireplaces	5.9%



On average, the NHPI Composite Index for British Columbia showed only a marginal declined (-0.1% per year) between 1981 and 1991 while the WPIP and the NHPI quality indexes respectively increased by 6.1% and 7.1% per year on average.



The relative stability of the NHPI Composite Index is due to the composition of quality improvements. From the weak performance of the average square footage and average number of bedrooms series, we can speculate that quality improvements in British Columbia are generated by other variables, such as the emergence of high priced condominiums and the use of more custom work. The NHPI quality index increased on average by 11.3% per year between 1986 and 1991, even though the average square footage of houses increased only by an average of 3.4% per year during the same period. This unexpected divergence may come from the type of constructions reported by major contractors included in the NHPI survey (perhaps more condominiums and less single houses). The high cost of land in British Columbia's major metropolitan areas is a great incentive for contractors to built more condominiums.

Micro Data from the Household Facilities and Equipment Survey

The Household Facilities and Equipment survey is an annual sample survey describing the different characteristics of the existing housing stock. Consequently, we can expect less quality improvements in this type of series as we can in new residential investment series, such as the WPIP, NHPI, NHA and MLS. The potential for quality improvements in new residential construction is greater because of new trends in housing and the supply-demand pressures sometimes induced by the economic cycle. In the existing housing stock, quality improvements are limited to renovation, dwelling conversions and structural additions, and since the stock is relatively large, the flow of new residential investment does not affect the overall housing quality of the stock. For the purpose of this study, we examined only three microeconomic quality indicators from this survey (the average number of bedrooms, rooms and toilet facilities).

In the province of Quebec, the average number of bedrooms declined on average by 0.3% per year between 1981 and 1990, while the average number of rooms remained constant. However, the average number of toilet facilities did report an average growth of 0.5% per year.

In British Columbia, the survey results are approximately similar, with the exception of larger increases in the average number of rooms and toilet facilities. The average number of bedrooms reported the same average decline of 0.3% per year, while the average number of rooms was up by an average of 0.4% per year between 1981 and 1990. An average growth of 0.9% was reported in the average number of toilet facilities during that period.

The results in Ontario resembles closely those found in British Columbia. The average number of bathrooms also went down by 0.3% on average, the average number of rooms increased by 0.6% on average while the average number of toilet facilities rose annually by 1.3% on average.



Conclusion and Recommendations

7.

Both analysis of Quebec, Ontario and British Columbia revealed that the average value of investment in constant dollars is a good indicator of changes in housing quality over time. With the New Housing Price Index (NHPI), we were able to separate price movements and quality changes in the current dollar residential investment series. The Quebec and Ontario results indicated that residential inflation was responsible at 86.0% and 67.0% for the upward trend recorded in residential investment between 1981 and 1991. In British Columbia, the results were quite different since the upward trend recorded during that period was attributed at 93.8% to quality improvements in housing.

To corroborate these findings, we compared the AVI in constant dollars from the WPIP investment series with other average costs series obtained from the NHPI and MLS surveys and the NHA statistics. Even though, all sources show important differences in methodology concepts, they all led more or less to the same results. Furthermore, microeconomic quality indicators from the NHPI survey and the Household Facilities and Equipment survey revealed similar findings.

With these encouraging results, we recommend the extension of this study to the remaining provinces. After the completion of all provinces, the *Current Investment Indicators Section* will be in position to produce an annual new housing quality index (NHQI) by province. Therefore, the new residential investment series with the NHPI will generate a new index entitled NHQI, which will describe the annual movements in housing quality in each province. Consequently, the analytical potential of the residential investment series will be increased substantially.





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