CMHC
Central Mortgage and Housing Corporation
Société centrale d'hypothèques et de logement

RESIDENTIAL REHABILITATION IN CANADA

- Technical Paper -

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(1) Foreword*

This paper is inspired by the recent evaluation of the Residential Rehabilitation Assistance Program. (Hussein Rostum (4)). Specifically the purpose of this paper is to elaborate upon the issues raised by Mr. Rostum as well as to discuss some of his oversight. For the interest of the reader, some of his views are quoted below.

- It is important for program and policy analysis, and for comparing the benefits to homeowners and landlords, to recognize to what extent landlords can deduct expenditures for repair from their income tax. This option is not open to homeowners (see Section 4).
- The report shows that in some cases the landlord can receive tax redemption up to 50 percent of the value of the RRAP loan by claiming rehabilitation costs as a tax deduction. (See Section 4).
- The research for this and previous evaluation reports on RRAP revealed that CMHC required tougher policies dealing with the credit worthiness of landlords and

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*For a non-technical treatment please consult "Residential Rehabilitation In Canada - Management Summary"

the economic viability of landlord-rehabilitated buildings. Since the first draft of this report was prepared the Corporation has introduced stricter policies with regard to economic viability. (See Section 4).

- The RRAP program requires competitive bidding by contractors and inspections, by CMHC or municipal staff, at various stages in the rehabilitation process. A number of problems with respect to these requirements were raised by CMHC field staff. Two which may require attention and further investigation are:
  (a) in some cities it is often difficult to obtain more than a single bid for a job (eg. Ottawa, Winnipeg, Montreal). Consequently rehabilitation costs and quality may be affected. (See Section 3).
  (b) the inspection process by municipal officials may not be adequate (eg. in Winnipeg). This has implications for costs, quality and the amount of CMHC staff time spent in vertification. (See Section 3).
- The question of program take-up is of major concern to the corporate planning process. Take-up is influenced by client preferences, municipal attitudes, administrative capability, rent controls, funding constraints, the rehabilitation industry, et cetera. (See Sections 3 to 5).

(2) Introduction and Summary

In view of the fact that Canada will experience a 20% decline in new residential construction activities over the next ten years, there is a growing interest toward the possibility of reallocating the idle resources to other residential related industries. One of them is the residential rehabilitation industry. This paper will examine the feasibility and the obstacles of such transition by looking at the supply of and demand for rehabilitation. In addition are three reasons why we need a more aggressive rehabilitation industry. First, there is mounting evidence indicating the potential need for rehabilitation. In 1974 16.9% of all rental households lived in a unit which required some form of rehabilitation and the figure goes as high as 56.2% for the category of family household of seven or more earning less than $10,000 annually. The comparable figures for owner-occupied households (valued at $74,999 or less) are 13.4% for all households and an alarming 100% for certain types of households. Despite healthy potential demand, it has not been translated into effective demand. Both the growth rate and the market

share of rehabilitation activities has been declining over the past decade and there is no indication that the trend will reverse itself in the near future. Second, premature dwelling deterioration in relative terms is observed in several Canadian cities; for example, in the dwelling age group of 4 to 14, Saskatoon has a 5.6% average net deterioration rate of the housing stock while St. John's has a low of 0.3%[1] With respect to the total stock, Winnipeg assumes the lead with 13.6% while Victoria is credited with a low of 2.6%. Third, the response to rehabilitation needs by different households is far from satisfactory and the poor attitude is especially apparent in the low to middle income households. In 1974 only 48.4% of the households earning between $10,000 and $14,999 and living in a unit in need of rehabilitation responded to the need. The lack of private incentives is a major contributing factor to the process of premature housing deteriorations.[2]

With the issues well defined, our analysis will first deal with the supply of rehabilitation. We shall concentrate on the growth and market share of repair activities, the performance of rehabilitation oriented

contractors, the stability of the industry and its long term trend. On the demand side we shall provide a microeconomic behavioral foundation which explains the incidence and magnitude of rehabilitation investment with respect to both owner-occupants and landlords. The paper concludes by abstracting empirical evidence using the 1974 Survey of Housing Units. It should be noted that the focus of this paper is not on rehabilitation program design, per se, nor is it a critical review of the existing program (on this subject see Rostum (4)); rather, it attempts to define the parameters and constraints a universal program must acknowledge and operate within.

We can summarize this study by noting that the residential rehabilitation industry has been a stable but an insignificant component of the construction industry as a whole. If its long term trend persists, the idle resources released by the forecast decline in

new residential construction are not likely to be absorbed by the market in the immediate future. At the microeconomic level the rehabilitation strategy over time is the outcome of dynamic optimization of potential net benefits on the part of individual economic agents, owner-occupants or landlords. It follows that observed housing quality decline is not an irrational process but an environment cultivated by market interactions. The need for government intervention is the need to ensure these market forces are indeed incentives to rehabilitation rather than deterrents.

(3) Residential Rehabilitation Industry

The residential construction industry in Canada can be broken down into two categories; first, firms whose principle activities are new construction and second, firms whose principal activities are repair and maintenance. According to Statistics Canada, new construction is defined to include all contracts for new work put in place. This includes additions, alterations

conversions and major renovations, where either a structural change takes place or the life of an existing asset is extended beyond its normal life expectancy. Repair construction, on the other hand, is defined to include all other construction work. This is generally construction necessitated by damage or deterioration and includes minor renovations and alterations made to maintain the operating efficiency of existing structures.

As witnessed in Table 3.1 the majority of residential rehabilitation establishments are small ventures. In 1976, for example, 92.1% of them had annual gross construction revenue of no more than ¼ million dollars and they accounted for more than 48% of total activities. New residential construction, on the other hand, had approximately 70% of the establishments below the ¼ million dollar mark but they produced only 10.4% of total value of output. The minor role played by firms specializing in repair construction is further demonstrated in the distribution of repair activities; a modest average of 60% of the market from 1973 to 1976. In terms of the diversification of activities, 9% of revenue of rehabilitation oriented firms came from new

construction in 1973 and the share subsequently increased to 16.8% in 1976. Although repair construction enjoyed a higher rate of return, for example, 16.2% in 1975 compared to 10.4% for new construction establishments, it is more susceptible to risk. Measuring risk as a percentage loss in relation to output and as a percentage of bad debts to output places repair activities consistently more uncertain than new construction. In addition, repair construction is more labor intensive. For each thousand dollars of output, repairs required as many as 52 manhours in 1974 compared to 17 manhours in new construction. Thus we can describe the rehabilitation industry as small, informal, profitable but risky, extremely labor intensive and insignificant as a sub-industry in the residential construction industry.

Many factors explain the insignificance and informality of the industry. One of them is a general lack of maintenance and occupancy standards. While new construction is governed by the National Building Code (with its local variations) which spells out complete and definitive acceptable design and construction methods and are enforceable by qualified building

Table 3.1 CHARACTERISTICS BY PRINCIPAL TYPE OF CONSTRUCTION [3]

ITEMS	ESTABLISHMENTS CLASSIFIED BY PRINCIPAL TYPE OF WORK							
	NEW CONSTRUCTION				REPAIR CONSTRUCTION			
	1973	1974	1975	1976	1973	1974	1975	1976
(1) % of total number of establishments	93.9	94.6	76.3	86.7	6.1	5.4	23.7	13.3
(2) % share of total new construction	99.8	99.9	99.4	99.4	0.2	0.1	0.6	0.6
(3) % share of total repair construction	43.5	39.4	38.6	40.1	56.5	60.6	61.4	60.9
(4) % of activities in								
new construction	98.8	99.2	97.6	98.1	9.0	8.6	14.0	16.8
repair construction	1.2	0.8	2.4	1.9	91.0	91.4	86.0	83.2
(5) % of establishments by size group**								
249,999 or less	70.4	65.4	79.5	70.8	90.6	86.9	98.6	92.1
250,000-499,999	15.5	16.9	13.1	13.0	5.4	8.6	0.8	4.5
500,000-999,999	7.9	8.7	2.9	7.4	3.5	2.8	0.4	2.3
1,000,000-1,999,999	3.7	4.9	2.2	4.4	0.5	1.7	0.2	0.7
2,000,000-9,999,999	2.3	3.5	2.0	3.7	-	-	*	0.4
10,000,000 or more	0.2	0.6	0.3	0.7	-	-	-	-
(6) Pre-tax net operating profit as a % of								
output	6.1	8.7	9.9	8.8	7.0	7.2	15.0	7.9
% Profit	6.6	9.1	10.4	9.4	7.5	7.7	16.2	9.0
% Loss	0.5	0.4	0.5	0.6	0.5	0.5	1.2	1.1
(7) Man-hour per thousand 1971 dollar of output	17.4	17.3	23.0	18.2	51.7	52.1	38.8	35.7
(8) Bad debts as a % of output	0.1	0.1	0.2	0.1	0.3	0.7	0.2	0.3

Table 3.1 continued

ITEMS	ESTABLISHMENTS CLASSIFIED BY PRINCIPAL TYPE OF WORK							
	NEW CONSTRUCTION				REPAIR CONSTRUCTION			
	1973	1974	1975	1976	1973	1974	1975	1976
(9) % of total output by size group								
249,999 or less	18.6	13.0	18.0	10.4	49.2	43.1	77.1	48.2
250,000-499,999	14.5	10.8	14.2	8.2	20.8	24.1	10.5	18.7
500,000-999,999	15.2	11.7	6.7	9.6	19.0	16.2	4.7	11.9
1,000,000-1,999,999	13.9	13.0	9.6	11.5	9.1	13.9	5.2	8.9
2,000,000-9,999,999	22.7	27.0	25.6	28.2	1.9	2.7	2.3	11.6
10,000,000 or more	15.1	24.5	25.9	32.1	-	-	0.2	0.7

Source: The Residential General Building Contracting Industry, 1973-1976
Statistics Canada, Catalogue 64-208

* less than 0.1%

** size groups are classified by gross construction revenue adjusted by change in work in progress.

inspectors, standards for existing structures are difficult to formulate and to enforce. This inability reflects the diversity of dwelling types. Even with health and safety guidelines, the application of such guidelines can be non-uniform; since, quite often, subjective interpretation is inevitable. This problem is further amplified by the popularity towards "do-it-yourself" repair activities due to escalating labor costs. A second factor is the households' attitude towards rehabilitation. This will be examined in great detail in the next section. A third factor is the apparent lack of entrepreneurial skills. Although there are abundant supply of sub-contractors who are willing and capable of doing portions of a large contract, e.g. electrical work, plastering, roofing etc., the most essential ingredient, i.e. management know-how such as cost estimating, design, specification and supervision is often in excess demand because rehabilitation techniques are so different from new construction and they are so difficult to acquire. Little effort is being made to train and develop contractors specifically for rehabilitation work and community and technical colleges are oriented to skills in new construction.

Often rehabilitation becomes a family type of business rather than an organized venture. The lack of interest from suitable contractors in certain RRAP projects highlights the problem (Rostum (4)).

An immediate consequence of few large firms with skills and experience to accept large contracts reflects in the much higher cost in rehabilitation than in an equivalent amount of new construction due to the absence of a corresponding degree of competition. A second explanation for the high cost is the substantial margin built-in for contingencies. As pointed out earlier, percentage loss and the ratio of bad debts were significantly higher in rehabilitation compared to new construction. It seems reasonable to suggest that the lack of maintenance and occupancy standards were, to some extent, responsible for this high degree of uncertainty.[4] To keep rehabilitation cost more in line with new construction, the industry has to be more competitive. Finally, there are two reasons to suspect low or absence of economies of scale in residential rehabilitation activities. First, the diverse nature

of rehabilitation projects does not lend itself to the standardization of techniques which would encourage large scale production. Second, the absence of large contracts in a single location or the predominance of numerous small contracts in a variety of locations would not permit the use of large scale production techniques, even if the latter did exist.

Having spelled out the microeconomic aspects of the industry it may be useful to trace its performance and idiosyncrasies through time. Chart 3.1 compares the expenditures generated by residential repair and maintenance activities, new residential construction and all construction from 1958 to 1977. While both new residential construction and all construction are increasing at an increasing rate through time, with average rates of 7.6% and 4.7% respectively, repair construction is increasing at a decreasing rate. Chart 3.2 which measures the growth rates of the three expenditure series further confirms the trend. Both the raw growth rate and the 3-year moving average growth rates of repair construction exhibit steady declines. Furthermore the share of repair construction in total residential construction is contracting quite

Chart 3.1 Types of Construction Expenditure, 1958-1977
(million 1971 dollars)

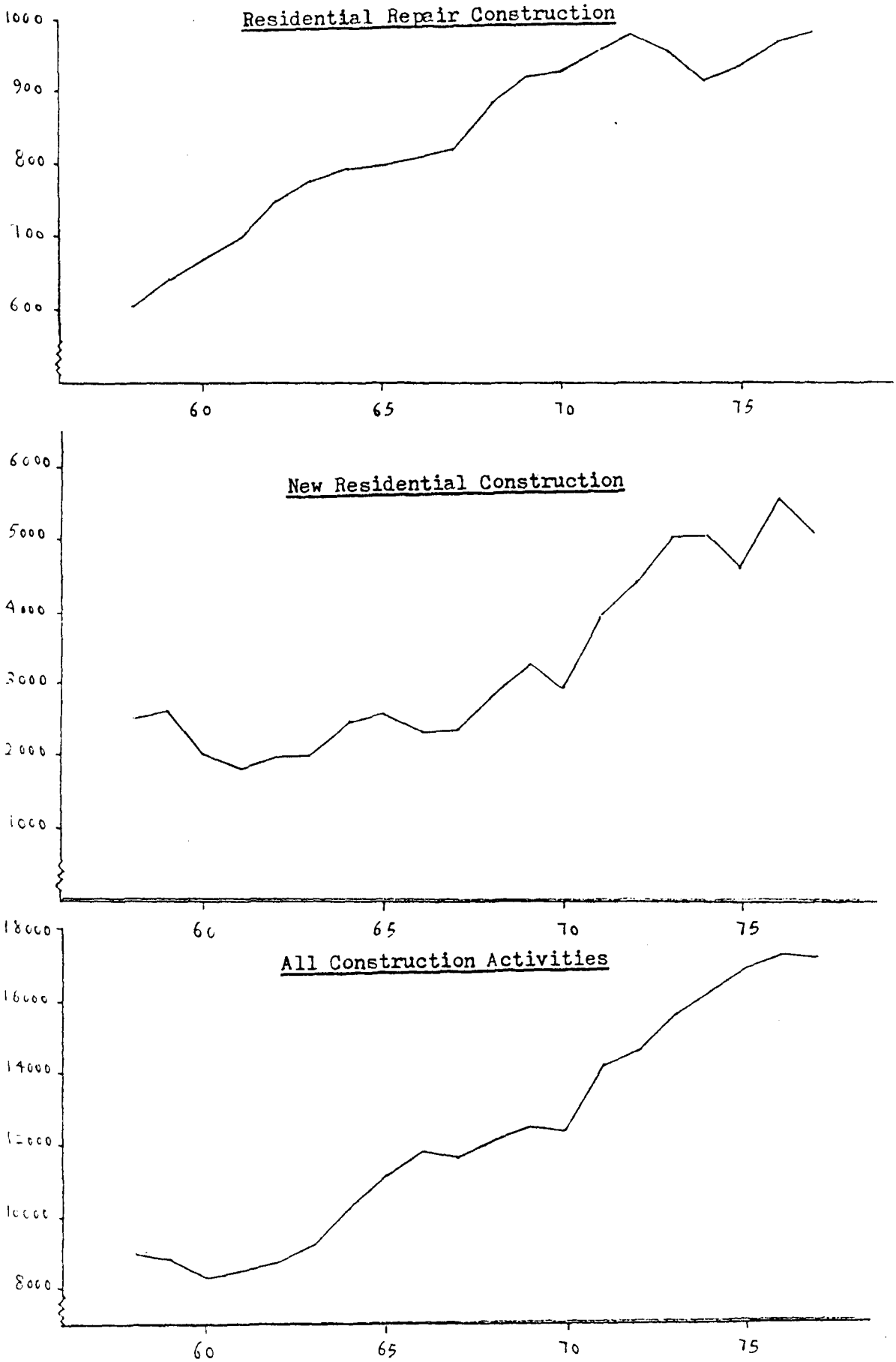


Chart 3.2 Real Growth Rates of Residential Repair, New Residential and All Construction Expenditure, 1958-77

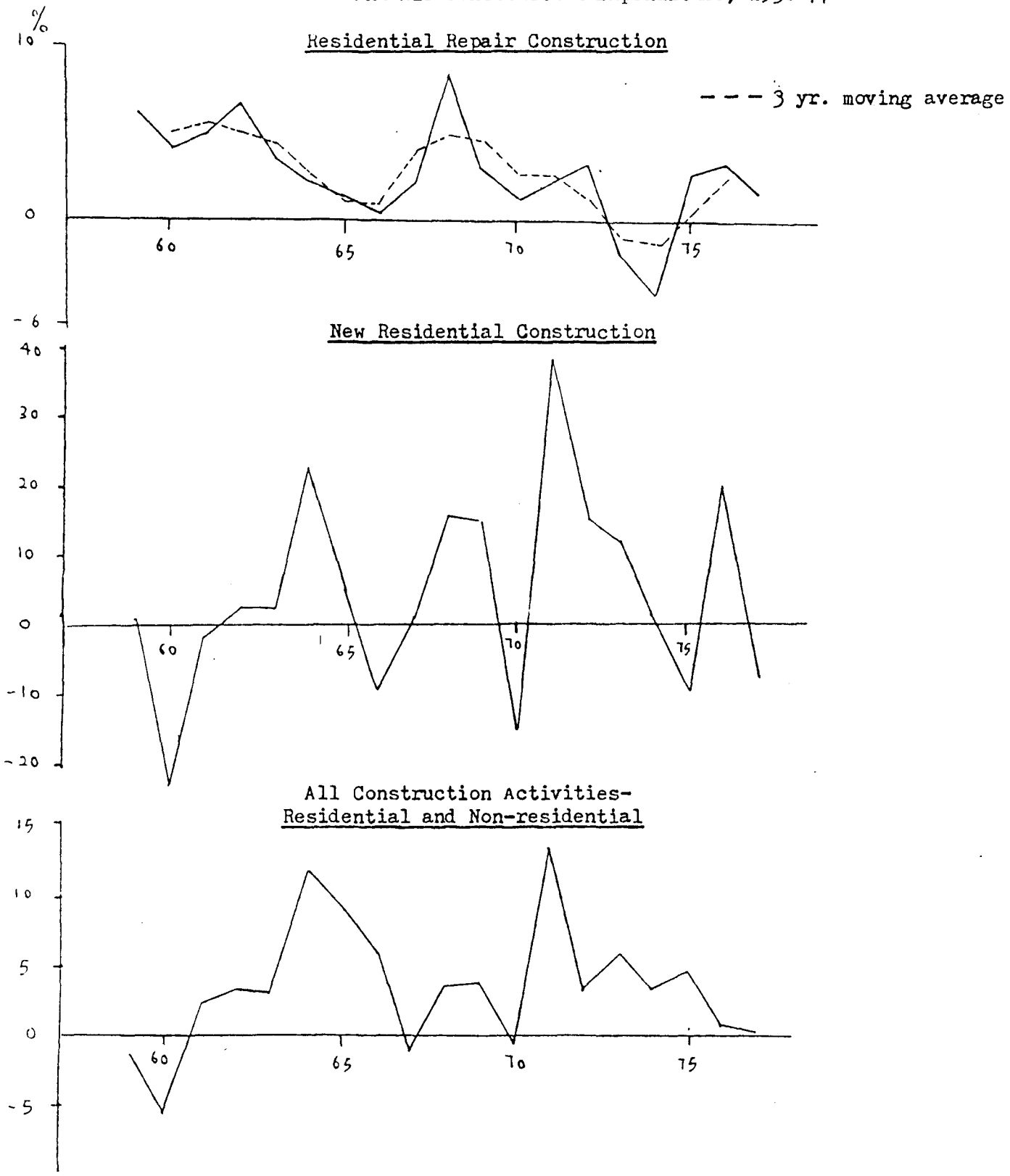
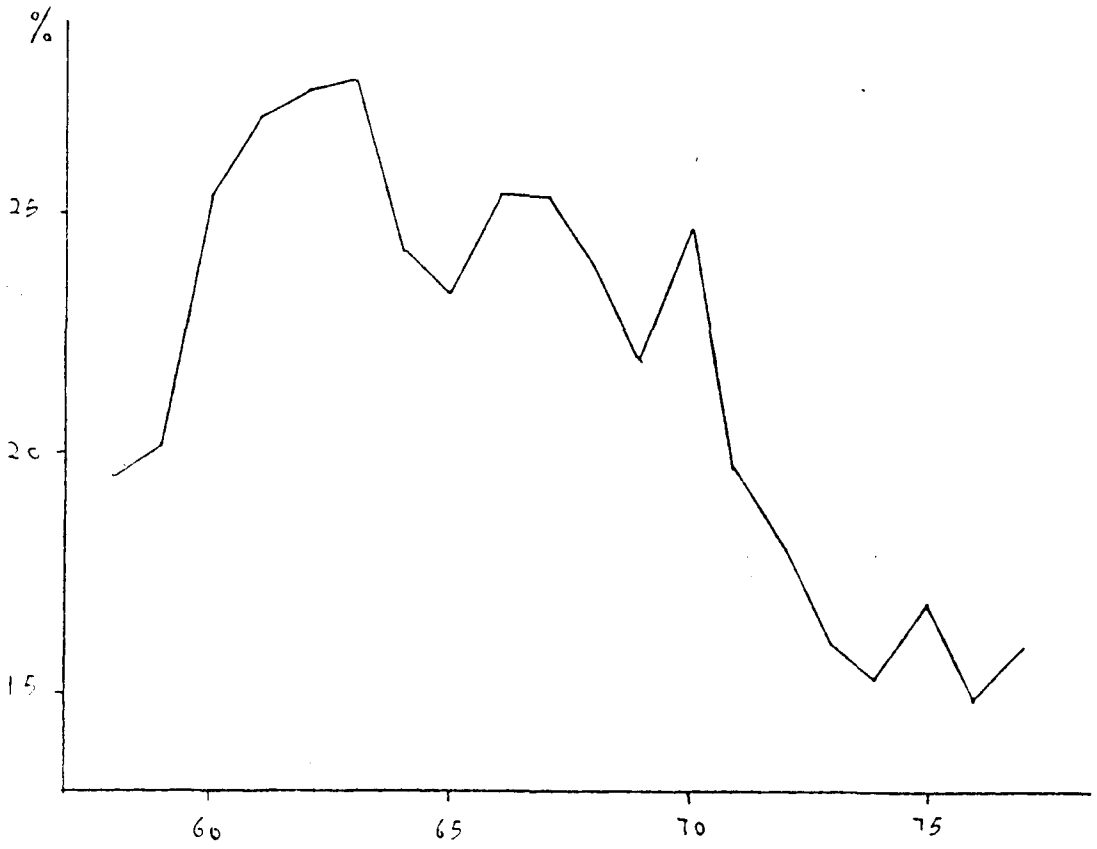


Chart 3.3 Market Share of Repair Construction, 1958-1977

Share of Repair Construction in Residential Construction



Share of Repair Construction in Total Residential and Non-residential Construction

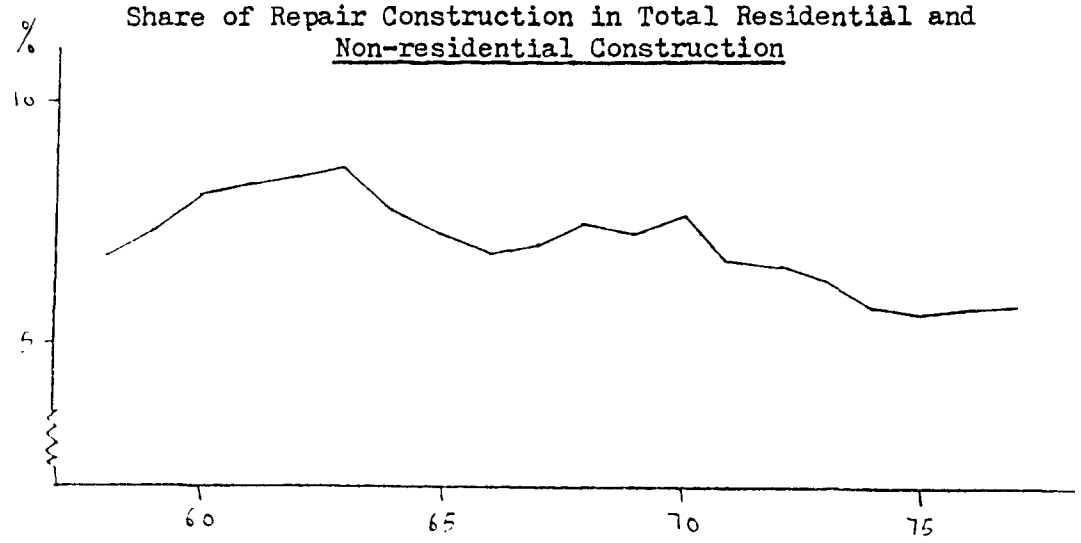
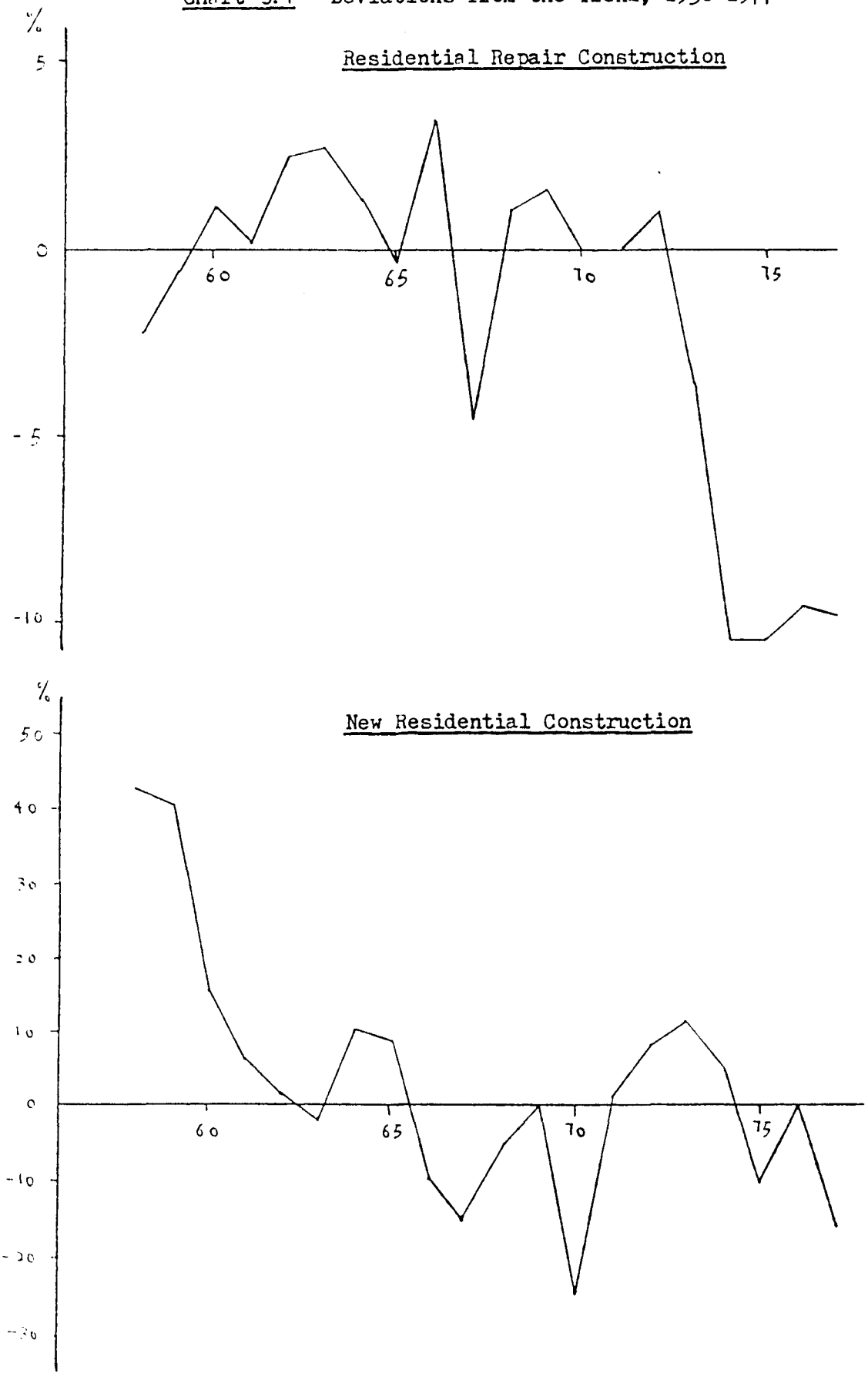


Chart 3.4 Deviations from the Trend, 1958-1977



significantly from a peak of 27.7% in 1963 to a low of 14.8% in 1976. The decline in the share in total residential and non-residential construction, however, is less dramatic; a drop of approximately three percentage points from peak to trough. (See Chart 3.3). A common question often raised in sectoral expenditures analysis is the issue of stability. Measuring stability as the percentage deviations from the long term trend, Chart 3.4, reveals that residential repair and maintenance activities from 1958 to 1973 displayed a rather stable growth path with only a modest variation of less than five percentage points. New residential construction, on the other hand, is much more unstable; it fluctuates with an average deviation of more than fifteen percentage points. Therefore we can conclude, with some degree of confidence, that rehabilitation activities did not significantly contribute to the overall instability of the construction industry. Nevertheless the stable trend we observed prior to 1974 deteriorated quite dramatically over the past few years.

(4) Economics of Rehabilitation

One interesting finding of the 1974 Survey of the Housing Units is the remarkable difference in the average net deterioration rate of the owner-occupied housing stock among different cities. Average net deterioration rate is conceptually defined as gross

Table 4.1 Percentage of owner-occupied dwellings in need of rehabilitation (net deterioration rate of housing stock) by dwelling age and by cities

	AGE OF DWELLING IN YEARS				
	4-14	15-24	25-34	35 OR MORE	ALL AGE CLASS
Winnipeg	1.6%	4.6%	11.1%	28.4%	13.6%
Victoria	0.6	0	1.8	5.3	2.6

Source: Survey of the Housing Units, 1974 (complete information in Table 4.2)

physical deterioration rate minus the rate of maintenance and repairs. As illustrated in Table 4.1

the percentage of owner-occupied dwellings which requires some form of rehabilitation is, on the average, substantially higher in Winnipeg compared to Victoria irrespective of the dwelling age, and in totality the absolute difference is an alarming 11.0 percentage points. Can we explain this vast differences? Housing conditions are not static and the present condition of the housing stock is the net result of cumulative effects of deterioration or obsolescence, intentional or otherwise, and of the effects of lack of capital investment and maintenance. There should be no objection to the suggestion that certain market forces are responsible for an owner's decision to permit deterioration, an action resulting from utility maximization rather than irrationality. The crucial question is if market conditions can cultivate undermaintenance, could they not also encourage maintenance and, to a greater extent, stimulate improvements? In this section we shall attempt to address this question. Ira Lowry in his 1960 paper (2) further advanced the hypothesis arguing that if the perverse market conditions were allowed to prevail for a sufficiently long period of time, the process of disinvestment through deterioration would

Table 4.2 Percentage of owner-occupied dwellings in need of rehabilitation by dwelling age and by cities *

SELECTED SURVEY AREA	AGE OF DWELLING IN YEARS				
	4-14	15-24	25-34	35 OR MORE	ALL AGE CLASS
Vancouver	0.4%	1.9%	4.3%	16.5%	7.8%
Victoria	0.6	0	1.8	5.3	2.6
Calgary	2.5	5.4	8.3	20.8	5.5
Edmonton	0.8	3.9	6.5	26.9	4.9
Regina	1.0	10.0	30.3	23.9	11.2
Saskatoon	5.6	8.9	19.7	24.1	11.3
Winnipeg	1.6	4.6	11.1	28.4	13.6
Sudbury	2.1	5.6	19.6	17.9	9.3
Toronto	0.5	1.1	4.0	18.0	6.4
Ottawa-Hull	0.4	3.9	8.7	13.7	4.4
Montreal	2.7	6.3	17.4	18.6	7.7
Quebec	0.9	1.9	3.9	12.6	3.7
Saint John	1.5	8.1	15.5	22.2	11.9
St. John's	0.3	2.5	9.7	12.6	6.7
Halifax	1.8	7.0	11.4	14.9	8.6
Charlottetown	0.8	3.8	4.9	9.8	5.1
Average	1.5	4.7	11.1	17.9	7.5

Source: Survey of Housing Units, 1974

* Percentage of dwellings in need ot rehabilitation can be interpreted as the net deterioration rate of the housing stock.

result in the filtering down of owners of lesser means and more modest tastes for housing. It follows that the migration of low income families to an area is the accommodation of a market outcome rather than the cause of neighbourhood decline.

Recently there is a growing interest towards modelling homeowners' optimal strategy in rehabilitation activities in terms of their magnitude, timing and comparative dynamics. Two such examples are Dildine and Massey (1) and James Sweeney (7). Since physical deterioration is a dynamic process, traditional static utility maximization on the part of homeowners is inappropriate and must be replaced by the dynamic maximization of a meaningful criterion over time linked by a discount rate. A plausible criterion readily available is the maximization of the sum of present discounted value of net rent and the present discounted value of the salvage value of the property at the end of its economic life subject to the constraint of the change of housing quality through time. Net rent can be conceived as the difference between gross rent and housing expenditures. Gross rent is defined as the user's

fee levied on a given quantity of housing having a certain set of qualitative characteristics. Thus gross rent is determined by dwelling size, location, level of demand and supply and the supply of substitute housing etc. Housing expenditures are of two varieties; those which are neutral to the physical quantity of the housing, for example, utilities and property taxes, and those which augment the quantity and quality of the dwelling, for example, repairs, maintenance and improvements. The application of the concept of gross rent or net rent to owner-occupied housing is valid if we recognize the owners' dual role as homeowners and tenants simultaneously. Salvage value of the dwelling is essentially its site value. The time path of housing quality is governed by the initial quality of the dwelling, the physical rate of deterioration and the level of expenditure in rehabilitation activities.

The model as it stands is complete and can be solved for the optimal time path of the level of rehabilitation expenditure and the optimal economic life of the dwelling. Due to the complexity of algebraic manipulations, as the solution requires the application

of control theory, detailed mathematical development will not be pursued, rather, attention will be given to the interpretation and comprehension of the underlying dynamics. For purposes of simplicity let us trace the causal effects of a sudden increase in the level of rehabilitation expenditure. This increases the quality of the dwelling which leads to (1) an increase in the gross rent, (2) an increase in property taxes[5], (3) a decrease in normal maintenance expenditure e.g. heating, hydro, and (4) a decrease in the physical rate of deterioration which increases the economic life of the dwelling. They are all first round effects and second round effects are characterized by their combinations. Specifically net rent will increase or decrease contingent upon the marginal cost and marginal benefits of rehabilitation and the same argument also applies to the time path of quality change constraint. Dynamic optimization enters in view of this indeterminacy and the optimal rule of rehabilitation investment is a positive (negative) (zero) growth rate of rehabilitation expenditure if and only if the cost inflation rate of rehabilitation less the discount rate, that is, the present discounted growth rate of rehabilitation cost,

is less than (greater than) (equal to) the growth rate of total future discounted gross rent derived from a unit addition to dwelling quality.

The economic interpretation of our optimal rehabilitation rule is simple and straightforward; accelerate investment if the rate of change in discounted cost is less than the rate of change in discounted benefits over the entire economic life of the dwelling, decelerate investment if the opposite dictates and hold the level of investment constant if the two growth rates are identical. Since each of the three possible outcomes is controlled by (1) gross rent, (2) price of rehabilitation, (3) discount rate (which may be approximated by the current interest rate) and (4) salvage value; a planning authority can manipulate the growth rate of rehabilitation expenditure by changing its determinants directly or indirectly. Let us consider a few specific cases. A highly progressive property tax structure for one may significantly reduce the incentive to rehabilitate. Changing the equilibrium gross market rent such as a decline in the market value of housing or policies which reduce the rent of

alternative housing are detrimental to private incentive while improving the community services, access and environment would induce a higher rate of rehabilitation via an increase in the equilibrium gross market rent. Changing the alternative value of a site, i.e. its salvage value by broadening its alternative use will reduce the optimal amount of investment throughout the remaining time horizon and if sufficient encouragement is provided immediate redevelopment will occur. Finally, government assistance programs such as outright grants or low cost loans will accelerate rehabilitation activities through a reduction in their effective price.

Given the fact that our results were founded on the basis of a simultaneous landlord and tenant relationship, i.e. an owner-occupant, do they hold in the case of a landlord? The basic difference between a landlord and an owner-occupant lies in the fact that the latter is affected directly by any changes in the rate of rehabilitation activities since he is the beneficiary as well as the investor while the former is merely an investor. In this light, a landlord's optimal time path of rehabilitation is governed by his flexibility to rent

the dwelling under different rehabilitation schemes and his ability to realize a higher rent that otherwise would not occur. It is precisely this lack of synchronization and uncertainty that constantly encouraged a landlord to invest at a lower rate than an owner-occupant.

The picture is further complicated by market distortions, the most significant one being the current income tax system. Tax deductions affect behavior in a rather peculiar way; they are incentives to the group receiving them but are disincentives to others not receiving them. Under the present tax system an owner-occupant is treated as a consumer and a landlord as producer and as such a landlord is entitled to certain rental income deductions not available to an owner-occupant although the latter, as we argued, is a simultaneous landlord and tenant in the strictest qualification. With reference to rehabilitation expenditure and related expenses such as interest charges, they are tax deductible which effectively lowers the real financial burden. Owner-occupants, having to assume one hundred percent of the cost, may

find frequent moving as a viable alternative to rehabilitation in terms of financial responsibility and may very well abandon rehabilitation completely. To provide an indication on the magnitude of the tax incentive, Hussein Rostum (4) shows that tax savings in the year which rehabilitation takes place could account for 47% of the sum of capital investment and first year interest charges (Rostum 1978, pp.24). Mr. Rostum further suggests:

> "...Tax deductions for RRAP landlords were also examined and it is concluded that this is an additional and significant advantage for landlords, but not for homeowners, under Canada's tax system, which should be taken into account when making policy or program decisions regarding the distribution of RRAP funds...." (Rostum 1978, pp.49)

As we have argued all along deterioration of a housing stock is an outcome of optimization rather than behavioral irrationality. If an owner-occupant had chosen to allow his dwelling to deteriorate for a sufficiently long period of time and if the planning authority is interested in restoring the dwelling to a

reasonable condition, is it always economically feasible to accomplish this by rehabilitating?

"....Most of the Branch Offices visted indicated that some assessment of the economic viability of the units to be rehabilitated should be done before issuing loans. The record of arrears for mortgaged RRAP loans is bad enough to lend support to this position.... To avoid write-offs when foreclosure or other legal actions take place ... an appraisal by our appraisal staff to estimate market value after rehabilitation...." (Rostum 1978, pp.29-31).

Improving the quality of sub-standard housing can be achieved by either rebuilding or by rehabilitating and the choice between the two is simply one with the greatest output per unit of factor input; in other words the minimum cost to produce a given quality standard of the output. This problem has been approached by many authors, notably, Needleman (3), Schaaf (5) and Sigsworth and Wilkinson (6). The choice rule is a familiar static cost-benefit variety.

$$C-\frac{C(1-nd)}{(1+i)^n} > R + (m_1 - m_2)\ \frac{(1-(1+i)^{-n})}{i} + (W_2 - W_1)\ \frac{(1-(1+i)^{-n})}{i} \quad \ldots.(1)$$

where

C= cost of demolition and rebuilding

R= rehabilitation cost

m_1= periodic maintenance cost of a rehabilitated structure

m_2= periodic maintenance cost of a rebuilt structure

i= periodic discount rate

n= economic life of the rehabilitated structure

W_1= periodic rent of the rehabilitated structure

W_2= periodic rent of the rebuilt structure

d= periodic physical deterioration rate

The right-hand side of equation (1) represents the explicit and implicit costs of rehabilitation evaluated at the current time period. The first term is simply the capital cost of a rehabilitation project. The second term is the present value of the periodic excess in maintenance costs of a rehabilitated structure over a rebuilt structure. The third term is the present value of the periodic (say, annual) amount foregone in rental income of a rehabilitated structure; explicit in the case of landlords and imputed in the case of owner-occupants. Finally the left-hand side of the equation is the net cost of rebuilding and is defined as the difference between the initial capital outlay and the present value of the salvage value calculated at the end of the nth period. Equation (1) can be written as:

$$\text{savings through rehabilitation} = S = CA_1 - R - (m_1 - m_2)\, A_2 - (W_2 - W_1)\, A_2 \quad \ldots\ldots(2)$$

where $$A_1 = \frac{(1+i)^n - (1-nd)}{(1+i)^n}$$

$$A_2 = \frac{(1-(1+i)^{-n})}{i}$$

According to our decision rule, equation (2), we want to find an optimal level of rehabilitation expenditure R so as to bring the savings S to a maximum. A sufficient condition for the existence of a maximum is a positive value of S. If, on the other hand, S takes on a zero value, rehabilitation or rebuilding is indifferent and if S is negative, rebuilding is preferred over rehabilitation.

Given fixed C, m_2, i, d and W_1 an increase in rehabilitation expenditure affects savings by (1) increasing the economic life of the rehabilitated structure which in turn increases A_1 and A_2, and (2) reducing the difference in maintenance costs through a decrease in m_1 and reducing the difference in rent through an increase in W_1. If the increase is sufficiently large, the combined effects will push savings from a negative value to a positive value thereby making rehabilitating economically feasible.

To further appreciate the mechanics of equation (2) let us concentrate on the hypothetical example in Table 4.3. The example considers the impact of investing in rehabilitation on the savings in capitalized cost which we intend to maximize. The four hypothetical levels of expenditure can be viewed as different rehabilitation strategies; for example, Case 1 corresponds to minimum code compliance, Case 2 corresponds to extensive structural repairs, Case 3 corresponds to modernization and finally, Case 4 corresponds to prestige rehabilitation.

Without rent control and government assistance both modernization and prestige rehabilitation are feasible but modernization is the optimal approach. With rent control effective at the level of pre-rehabilitation none of the strategies considered are feasible. As a matter of fact minimum code compliance becomes the second best but sub-optimal solution. Sub-optimality arises because the landlord can realize lower capitalized cost by demolishing and rebuilding the existing structure, thereby able to impose the maximum return on his investment. Rent control, however, is neutral to owner-occupants. The detrimental effect of rent control is further witnessed in the Residential Rehabilitation Assistance Program.[6]

> "....It is not advantageous for a landlord to rehabilitate a substandard building, and not be allowed to increase his rents to cover his costs and make some profit. Stringent rent controls would discourage landlord take-up. On the other hand, large rent increases result in hardships for the low-income tenants who either have to pay a greater proportion of their income

Table 4.3 A Hypothetical Example

Rebuilt Structure	(1)	Annual Maintenance	$ 800
	(2)	Capital Cost	$100,000
	(3)	Annual Rent	$ 10,000
Additional Assumptions	(1)	Pre-Rehab Rent	$ 3,600
	(2)	Discount Rate	7%
	(3)	Depreciation Rate	2%

Rehabilitated Structure	Case 1	Case 2	Case 3	Case 4
(1) Capital Cost	$8,000	$20,000	$40,000	$80,000
(2) Annual Rent	3,600	3,600	7,000	9,000
(3) Annual Maintenance	2,000	1,400	1,000	1,000
(4) Structure Life (years)	10	40	40	40

Savings in Capitalized Cost

(1) Without assistance and Rent Control	-$2,050	-$14,662	-$15,999	$ 2,662
(2) With Rent Control at Pre-Rehabilitation Level	-$2,050	-$14,662	-$29,329	-$69,329
(3) With Assistance of $5,000	$2,950	-$ 9,662	-$20,999	$ 7,762

> for rent or who have to relocate to cheaper accommodation, thereby not benefitting directly from the government's investment in residential rehabilitation. The resulting situation is a trade-off between effective rent controls and sufficient landlord take-up to respond to rehabilitation needs..." (Rostum 1978, pp. 45-46)

Finally the effect of a direct government subsidy is obvious, it provides a dollar-to-dollar offset in the required rehabilitation expenditure which increases the likelihood of a positive savings in capitalized cost.

An implicit assumption operating in equation (1) or (2) is the rebuilding of the rehabilitated structure after n periods of physical deterioration. However this is not the only outcome. It is theoretically plausible to rehabilitate the structure at minimum cost, such as simple code compliance, for a number of times prior to rebuilding; or some other combinations of different levels of rehabilitation for any number of times individually. No matter what the combination one might hypothesize, the decision rule is still basically equation (2).

To sum up, this section has spelled out the basic behavior towards rehabilitation with regard to both owner-occupants and landlords. Landlords viewed themselves primarily as producers of housing services which implies that renewal is simply a profitability matter, that is, renew if expected monetary gains outweigh expected monetary costs in present value terms. They welcome government concessions such as tax incentives, loans and grants but dislike rent control. Owner-occupants, on the other hand, are consumers of housing services; by and large their attitude towards renewal is governed by taste and relative costs in adjusting to their housing consumption. Tenants play no significant role in rehabilitation activities since their response is largely obligatory rather than as a result of choice. Despite this they are still final consumers of housing improvements and beneficiaries of rent control. The need for government intervention arises from the need to reconcile these basic differences and as such sufficient flexibility must be incorporated in the programs.

(5) Empirical Evidence

In this section we shall attempt to identify the socio-economic characteristics of the households who occupy a unit in need of rehabilitation. We shall also investigate the determinants of the incidence and magnitude of rehabilitation investment. Using the information provided by the Survey of Housing Units, the percentage of households living in a unit in need of rehabilitation is crosstabulated by a set of socio-economic characteristics. This is shown in Table 5.1 to Table 5.7. A unit in need of rehabilitation is defined as one which includes most but not all of the vital structural (e.g. bad foundation, decaying wood) and non-structural defects (e.g. broken windows, poor paint). Five attritubes are under consideration and they are

(a) Household type: family, non-family

(b) Age of head: less than 35, 35-59, 60 or over

(c) Household size: 4 or less, 5-6, 7 or more

(d) Household income: under $10,000, $10,000-$14,999, $15,000-$19,999, $20,000 or more

(e) Dwelling value: under $45,000, $45,000-$59,999, $60,000-$74,999.

For the renter-households, age of head and dwelling value are unoperational; the former due to insufficient data and the latter due to inapplicability. On an *a priori* belief we would expect the percentage of households (which could also be interpreted as the probability) living in a unit in need of rehabilitation to go down with respect to rising income, higher value of dwelling, the two tails of the age profile, decreasing family size and family households rather than non-family households. In terms of tenure mode the expected relationship is less clear. Now let us determine to what extent the data agree without hypotheses.

As expected the majority of the owner-households living in a unit in need of rehabilitation are those characterized by low income (below $14,999), modest dwelling value (under $45,000), large household size and younger or older household head (below 35 or above 60). Furthermore the problem worsens for non-family owner-households. As for the renters, low income and large household size contributed significantly to the probability of living in a unit in need of rehabilitation. Other things being equal renters have a higher likelihood to occupying a run-down unit than owners.

For the households in the higher income and dwelling value categories, the relationship is more ambiguous and erratic. There is no clear-cut evidence supporting the hypothesis that higher income or more expensive housing will encourage the dweller to maintain his dwelling at a higher rate. It seems not unreasonable to suggest the lack of private incentives toward rehabilitation when income is not a constraint. In the case of low income homeowners, affordability seems to be the primary cause.

A seemingly unusual feature in our dynamic optimization model is the lack of traditional socio-economic variables such as household income. As a result the optimization rule over time can only be interpretated as notional or planned rehabilitation investment. Effective investment in a given time interval is constrained by income; that is, what is planned can be realized if and only if the financial resources are available. In this light our estimation results are short-term since in the long-run an individual has a significant degree of control over his income stream thus making income as an inoperative constraint. One

way to model this short-term behavior is the popular dual decision hypothesis. In this context rehabilitation expenditure can be thought of as a two-stage decision making process. The first stage involves a quantal or dichotomous decision to invest in rehabilitation or not to invest in rehabilitation. Such subjective probabilistic measure can be estimated by applying classical probit or logit technique. If the decision making unit decided to rehabilitate, a second round decision is required to determine the magnitude of the expenditure. Under this regime multiple regression is the appropriate estimation technique.

It should be noted that our two-stage decision making hypothesis is nothing but a re-statement of the optimal rule of rehabilitation investment throughout the economic life of the dwelling (derived in the previous section) in a manner that could be tested empirically. Unfortunately due to the lack of appropriate longitudinal data further attempts had to be abandoned. An alternative procedure which may shed some light with respect to identifying the households who invest in

rehabilitation at a point in time is to crosstabulate the relative frequencies of the investors by the relevant attributes. From the 1974 Survey of Housing Units a five dimensional contingency table is derived with household income, expected dwelling selling price, probability of moving and condition of the dwelling as the a priori independent variables. The single dependent variable is the response to the survey question "Did this household spend any money on repairs and maintenance for this dwelling in 1973?" The results are presented in Table 5.9 (for definition of variables see Table 5.11). Based on conventional wisdom we would expect household income, expected selling price and poor dwelling condition to have a positive impact on the relative frequencies (which may be interpretated as the probability) to rehabilitate and probability of moving to have a negative impact. However the data failed to support these theoretical claims. The only attribute which enters significantly in a consistent fashion is condition of the dwelling.

Second, ordinary least squares is applied to the households with non-zero rehabilitation expenditure. The findings are:

(1) All response coefficients displayed the expected sign (see Table 5.10) expect for age of head and length of tenure. Rehabilitation expenditure responded positively to an increase in household income, expected dwelling selling price, number of adults in the household, age of the dwelling and floor area but responded negatively to an increase in the probability of moving, number of children in the household. In addition rehabilitation expenditure would decrease if the dwelling is located in a commercial area rather than in a residential area, ceteris paribus. Furthermore, the fact that the dwelling represents a non-condominium seems to be an important deciding factor.

(2) In general the response elasticities, which measure the percentage change of rehabilitation expenditure for a unit percentage change in the independent variables, are fairly low. This is consistent with the previous study on the family expenditure survey data (see Residential Rehabilitation - some further results; September 12, 1978) which suggested the quasi-fixity of rehabilitation expenditure.

Before we leave this section let us provide a brief summary:

(a) Other things being equal, a renter has a higher probability of living in a unit in need of rehabilitation compared to an owner.

(b) With respect to rehabilitation expenditure an affordability problem exists in low income households

(c) The attitude towards rehabilitation among high income households is poor and sluggish. Normal repair and maintenance activity is not a priority item in consumer budget allocation.

(d) In 1974 13.4% of the housing stock (all rental units and owner-occupied units under $75,000) requires some form of rehabilitation. The distribution among rentals and non-rentals is 65.7% and 34.3% respectively. Using the same figures, a RRAP program with an income eligibility fixed at $10,000 annually has the potential to reach 51.9% of all rehabilitable units.

(e) The integral effect of poor attitude and affordability problem produces convincing evidence of premature deterioration found in several Canadian cities.

Table 5.1 Percentage of owner-occupied dwellings in need of rehabilitation by socio-economic characteristics (family household and head age less than 35)

Family household and head age less than 35	Household Size					
	4 or less		5 - 6		7 or more	
Dwelling value and household income	Group Count	RRAP %	Group Count	RRAP %	Group Count	RRAP %
Less than $45,000:						
Under $10,000	21,092	15.2	5,357	24.6	537	23.7
$10,000-$14,999	49,274	11.3	13,037	9.6	598	48.2
$15,000-$19,999	34,565	8.4	9,336	17.4	884	8.2
$20,000 or more	27,516	7.4	4,391	3.9	275	4.6
$45,000-$59,999:						
Under $10,000	5,061	9.7	933	0.5	68	0
$10,000-$14,999	15,013	7.9	3,931	15.7	147	0
$15,000-$19,999	18,085	8.0	2,386	0.4	542	0
$20,000 or more	21,984	4.1	2,496	16.6	1,140	29.8
$60,000-$74,999:						
Under $10,000	1,816	0.4	962	0	26	0
$10,000-$14,999	5,788	6.1	1,981	0	148	100.0
$15,000-$19,999	7,297	0.4	1,935	0	45	0
$20,000 or more	16,173	2.3	4,322	26.2	496	0

Source: Survey of Housing Units, 1974
RRAP = in need of rehabilitation

Table 5.2 Percentage of owner-occupied dwellings in need of rehabilitation by socio-economic characteristics (family household and head age 35 - 59)

Family household and head age 35 - 59	Household Size					
	4 or less		5 - 6		7 or more	
Dwelling value and household income	Group Count	RRAP %	Group Count	RRAP %	Group Count	RRAP %
Less than $45,000:						
Under $10,000	57,853	14.4	21,319	16.0	6,145	22.4
$10,000-$14,999	88,345	11.6	38,898	9.5	9,363	17.7
$15,000-$19,999	63,216	6.5	34,039	9.9	6,166	19.8
$20,000 or more	59,235	10.5	35,397	7.7	13,253	17.6
$45,000-$59,999:						
Under $10,000	16,077	6.4	8,420	7.3	444	11.0
$10,000-$14,999	36,255	3.2	15,830	2.8	1,819	27.4
$15,000-$19,999	35,238	6.4	16,470	7.3	4,180	2.8
$20,000 or more	45,626	4.7	26,133	4.4	5,060	20.9
$60,000-$74,999:						
Under $10,000	11,359	2.4	3,641	32.3	922	0
$10,000-$14,999	19,859	4.3	12,067	1.8	582	5.4
$15,000-$19,999	25,761	5.2	7,475	5.8	1,942	0
$20,000 or more	43,307	1.7	17,703	0.7	4,909	10.9

Source: Survey of Housing Units, 1974
RRAP = in need of rehabilitation

Table 5.3 Percentage of owner-occupied dwellings in need of rehabilitation by socio-economic characteristics (family household and head age 60 or over)

Family household and head age 60 or over	Household Size					
	4 or less		5 - 6		7 or more	
Dwelling value and household income	Group Count	RRAP %	Group Count	RRAP %	Group Count	RRAP %
Less than $45,000:						
Under $10,000	92,614	10.8	1,467	31.9	222	1.9
$10,000-$14,999	35,602	12.1	509	16.6	254	71.0
$15,000-$19,999	14,666	10.4	1,009	15.0	373	16.6
$20,000 or more	14,993	9.1	4,640	5.4	938	3.4
$45,000-$59,999:						
Under $10,000	18,351	2.2	441	1.9	0	*
$10,000-$14,999	9,587	7.1	575	0	27	0
$15,000-$19,999	5,779	6.4	168	0	65	15.1
$20,000 or more	8,096	14.2	1,384	85.3	471	0
$60,000-$74,999:						
Under $10,000	10,724	0.6	153	0	94	0
$10,000-$14,999	8,966	8.1	58	21.2	0	*
$15,000-$19,999	3,485	1.0	443	0	0	*
$20,000 or more	9,295	4.0	993	0	10	0

Source: Survey of Housing Units, 1974

* not applicable

RRAP = in need of rehabilitation

Table 5.4 Percentage of owner-occupied dwellings in need of rehabilitation by socio-economic characteristics (non-family household and head age less than 35)

Non-Family household and head age less than 35	Household Size					
	4 or less		5 - 6		7 or more	
Dwelling value and household income	Group Count	RRAP %	Group Count	RRAP %	Group Count	RRAP %
Less than $45,000:						
Under $10,000	2,165	30.0	0	*	0	*
$10,000-$14,999	3,397	17.8	0	*	0	*
$15,000-$19,999	1,331	10.9	122	77.9	0	*
$20,000 or more	981	12.6	7	0	0	*
$45,000-$59,999:						
Under $10,000	272	0	0	*	0	*
$10,000-$14,999	1,328	0.5	0	*	0	*
$15,000-$19,999	1,101	38.2	30	0	0	*
$20,000 or more	560	57.4	0	*	0	*
$60,000-$74,999:						
Under $10,000	166	0	0	*	0	*
$10,000-$14,999	474	18.9	0	*	0	*
$15,000-$19,999	50	0	0	*	0	*
$20,000 or more	257	5.1	44	0	0	*

Source: Survey of Housing Units, 1974

* not applicable

RRAP = in need of rehabilitation

Table 5.5 Percentage of owner-occupied dwellings in need of rehabilitation by socio-economic characteristics (non-family household and head age 35 - 59)

Non-Family households and head age 35 - 59	Household Size					
	4 or less		5 - 6		7 or more	
Dwelling value and household income	Group Count	RRAP %	Group Count	RRAP %	Group Count	RRAP %
Less than $45,000:						
Under $10,000	14,319	21.3	58	10.1	9	0
$10,000-$14,999	7,620	18.0	109	43.5	42	61.8
$15,000-$19,999	3,768	13.7	108	8.6	0	*
$20,000 or more	3,347	12.1	126	0	26	0
$45,000-$59,999:						
Under $10,000	4,613	12.6	55	0	0	*
$10,000-$14,999	3,079	2.7	0	*	0	*
$15,000-$19,999	1,572	0	31	0	0	*
$20,000 or more	2,139	31.6	55	0	0	*
$60,000-$74,999:						
Under $10,000	2,659	0.4	152	0	0	*
$10,000-$14,999	766	0	0	*	0	*
$15,000-$19,999	1,271	15.6	0	*	0	*
$20,000 or more	1,928	0.5	0	*	0	*

Source: Survey of Housing Units, 1974

* not applicable

RRAP = in need of rehabilitation

Table 5.6 Percentage of owner-occupied dwellings in need of rehabilitation by socio-economic characteristics (non-family household and head age 60 or over)

Non-Family households and head age 60 or over	Household Size					
	4 or less		5 - 6		7 or more	
Dwelling value and household income	Group Count	RRAP %	Group Count	RRAP %	Group Count	RRAP %
Less than $45,000:						
Under $10,000	56,808	22.1	285	31.2	0	*
$10,000-$14,999	6,783	24.4	161	24.1	46	18.2
$15,000-$19,999	3,861	14.6	168	34.7	131	21.3
$20,000 or more	2,740	1.3	386	60.8	16	0
$45,000-$59,999:						
Under $10,000	12,217	13.1	0	*	0	*
$10,000-$14,999	3,409	0	0	*	0	*
$15,000-$19,999	477	0	0	*	492	97.9
$20,000 or more	580	0	10	0	36	0
$60,000-$74,999:						
Under $10,000	5,991	7.7	0	*	0	*
$10,000-$14,999	1,247	0	0	*	0	*
$15,000-$19,999	226	56.0	58	0	7	100.0
$20,000 or more	680	0	505	0	0	*

Source: Survey of Housing Units, 1974

* not applicable

RRAP = in need of rehabilitation

Table 5.7 Percentage of renter-occupied dwellings in need of rehabilitation by socio-economic characteristics

All Renters	Household Type			
	Family Household		Non-family Household	
Household size and household income	Group Count	RRAP %	Group Count	RRAP %
4 or less:				
Under $10,000	366,205	21.3	400,408	16.9
$10,000-$14,999	251,693	14.4	107,003	11.3
$15,000-$19,999	142,126	9.0	59,137	13.6
$20,000 or more	108,395	9.9	33,367	10.1
5 - 6:				
Under $10,000	47,484	25.8	515	2.1
$10,000-$14,999	36,257	20.1	189	32.8
$15,000-$19,999	21,888	24.4	906	64.0
$20,000 or more	19,178	27.7	1,717	28.8
7 or more:				
Under $10,000	12,837	56.2	7	0
$10,000-$14,999	7,779	49.1	41	0
$15,000-$19,999	4,314	30.6	67	0
$20,000 or more	3,102	38.1	65	44.6

Source: Survey of Housing Units, 1974

RRAP = in need of rehabilitation

Table 5.8 Percentage of dwellings in need of rehabilitation by household type, household income and tenure mode

Tenure and household income	Household Type: Family household No. of units	Family household % of Group Count	Non-family household No. of units	Non-family household % of Group Count	All households No. of Units	All households % of Group Count
Renter:						
Under $10,000	97,467	22.9	67,680	16.9	165,147	20.0
$10,000-$14,999	47,350	16.0	12,153	11.3	59,503	14.8
$15,000-$19,999	19,452	11.6	8,622	14.3	28,074	12.3
$20,000 or more	17,225	13.2	3,894	11.1	21,119	12.7
Sub-Total	181,494	17.8	92,349	15.3	273,843	16.9
*Owner:						
Under $10,000	32,357	11.3	18,979	19.0	51,336	13.3
$10,000-$14,999	34,184	9.3	3,934	13.8	38,118	9.6
$15,000-$19,999	22,301	7.5	2,649	17.9	24,950	8.0
$20,000 or more	26,763	7.2	1,818	12.6	28,581	7.4
Sub-Total	115,605	8.8	27,380	17.4	142,985	9.7
Ground Total	297,099	12.7	119,729	15.7	416,828	13.4

Source: Survey of Housing Units, 1974

*Dwelling value less than $75,000

Table 5.9 Relative Frequencies of Non-Zero Rehabilitation Expenditure

Value of Dwelling and Household Income	Condition of Dwelling: Good — Probability of Moving			Condition of Dwelling: Rehabilitate — Probability of Moving		
	< 50%	=50%	>50%	< 50%	=50%	>50%
Value: under $40,000						
Under $10,000	.501	.495	.462	.755	.830	.569
$10,000 - $14,999	.501	.426	.476	.414	.504	.453
15,000 - 19,999	.581	.568	.433	.759	.975	.380
20,000 - 24,999	.610	.558	.532	-	.770	.738
25,000 and over	.365	.567	.477	.917	1.0	.423
Value: $40,000-$54,999						
Under $10,000	.621	.355	.451	.745	.432	.428
$10,000 - $14,999	.417	.534	.453	.252	-	.807
15,000 - 19,999	.515	.389	.458	.682	.861	.460
20,000 - 24,999	.433	.501	.520	.393	-	.657
25,000 and over	.290	.387	.422	-	1.0	.499
Value: $55,000-$69,999						
Under $10,000	.505	.731	.447	1.0	-	.733
15,999 - 19,999	.285	.366	.470	1.0	.336	.262
20,000 - 24,999	.398	.346	.492	-	0.0	.315
25,000 and over	.516	.484	.560	0.0	-	.829
	.609	.547	.450	-	1.0	1.0
Value: $70,000-$84,999						
Under $10,000	.674	.486	.431	-	0.0	1.0
$10,000 - $14,999	.926	.826	.415	1.0	-	-
15,000 - 19,999	.373	.083	.364	-	-	-
20,000 - 24,999	.682	.560	.379	-	-	0.0
25,000 and over	.378	.192	.582	-	-	-
Value: $85,000 and over						
Under $10,000	.959	.470	.365	-	-	-
$10,000 - $14,999	.123	.320	.372	-	-	1.0
15,000 - 19,999	.268	.282	.308	-	-	-
20,000 - 24,999	.039	.192	.440	-	-	-
25,00 and over	.486	.443	.447	-	0.0	-

Table 5.10 Regression Results

	Independent Variables	Response Coefficient	Statistical Significant	Variable Measurement
(1)	Household Income	0.00287	95%	Continuous
(2)	Expected selling price	0.00514	95%	Continuous
(3)	Probability of moving	-239.85	99%	Discrete
(4)	Residential area	4.92	95%	Quantal
(5)	Commercial area	- 80.36	99%	Quantal
(6)	Industrial area	a		Quantal
(7)	Number of adults	2.73	Insignificant	Continuous
(8)	Number of childen	- 66.29	99%	Continuous
(9)	Owned or being bought a condominium	a		Quantal
(10)	Owned or being bought as a condominium	561.22	99%	Quantal
(11)	Age of the dwelling	14.46	99%	Discrete
(12)	Length of tenure	- 2.88	99%	Continuous
(13)	Floor area	0.3557	95%	Continuous
(14)	Age of head	- 15.05	99%	Continuous

[a]The two variables had to be excluded from the regression equation so as to avoid the "dummy variable trap".

Table 5.11 Definition of Variables

(1) Rehabilitation expenditure - the amount in dollars on repairs and maintenance on the dwelling in 1973.

(2) Household income - sum of labour income, non-labour income and transfer income for all members in the household in 1973.

(3) Household - any person or group of persons occupying a dwelling unit as their usual place of residence.

(4) Expected selling price - the selling price expected by the owner if the dwelling had been sold at the time of the survey.

(5) Probability of moving - the chance that the household will move from the present dwelling within the next three years, that is, 1975, 1976 and 1977.

(6) Residential area - land use directly across the street and on both sides must be either low density residential (for non-condominium) or high density residential (for condominiums) or park land or open space.

(7) Commercial area - land use directly across the street and on both sides can be anything except industrial.

(8) Industrial area - presence of industries directly across the street or on either sides.

(9) Number of adults - Number of household members 18 years of age or above.

(10) Number of children - Number of household members less than 17 years of age.

(11) Length of tenure - period of residency ending December 31, 1973 in years.

(12) Floor area - total area in square feet of rooms classified as living space and bedrooms.

(6) Policy Recommendation

The issues raised in this ection can be broken down into two categories: supply management and demand management. It should be noted that they are, by no means, independent options but must be considered jointly. In other words the success of an incentive oriented demand management program is contingent upon the ability of the industry to efficiently absorb the excessive burden.

Supply Management Policies

Although there is no indication of a deficient supply of labor and capital, the lack of entrepreneurial skills, the absence of economies of scale in production, the considerable degree of risk and uncertainty and the lack of competition are all factors which accounted for the inefficiency and insignificance of the residential rehabilitation industry. New construction oriented firms must be encouraged to enter and the entire sub-industry must be geared towards better managerial know-how and rehabilitation technology. Government sponsored demonstration projects should have a broader scope than just to bridge the gap between demand and supply; they should also be viewed as an experiment with objectives

such as to stimulate the interest of the suppliers, to demonstrate the potential profitability and to identify and reconcile the problems encountered.

To ensure the smooth expansion of rehabilitation activities, maintenance and occupancy standards must be unambiguous, enforceable and complete. These ingredients are essential to the uniformity of the industry and to the wholesale reduction in risk and uncertainty.

Finally the residential construction industry must be made aware of the imminent decline in new construction activities and that the transition into repair construction is the only logical alternative available to them in terms of future social need and the survival of the industry.

Demand Management Policies

Premature housing deterioration, which in effect translates into social wastage and inefficiency, should not be viewed as an irrational process; it is simply a matter of affordability. In this light direct

government subsidies or low cost loans to low income owner-households and low income rental suppliers have the potential of reducing the universe of units in need of rehabilitation by as much as 35.9% and 60.3% respectively. (assuming income eligibility is set at under $10,000). Increasing the income eligibility to under $15,000 increases the upper limit to 82% for rental units and 62.6% for owner- occupied units.

Given the fact that the government is interested in maintaining the standard of housing quality, a more economical way to achieve this is renewal through rehabilitation rather than renewal through replacement.

A spillover from making the industry more competitive and efficient is to make rehabilitation an economically feasible investment (in terms of costs and benefits) through lower capital costs. This allows the transformation of potential need into effective demand which otherwise would not occur.

Footnotes

1. Net deterioration rate is defined as gross physical deterioration rate minus the rate of repairs and maintenance. Average net deterioration rate is the observed relative frequency of housing units in need of rehabilitation.
2. Private incentives are undistorted behavioral response; that is, without government interventions.
3. The figures presented in Table 3.1 must not be viewed as the absolute measurements of the different characteristics; rather, they should be interpreted as indications in relative terms at a specific point in time. The ambiguities are due to
   (a) Significant residential building construction is performed by owner builders and project managers who are not classified to the construction industry and who, for this reason, are not included in the sample.
   (b) Residential building construction performed by general contractors primarily engaged in non-residential and engineering construction is not included.
   (c) In 1973 and 1974 no adjustment is made for non-response.

4. Very often it is extremely difficult to predict the amount of rehabilitation work required under the standards and guidelines set out by the different levels of government. In some instances the interior walls have to be removed before one can determine the extent of rehabilitation required; e.g. plumbing and electrical wiring.
5. "....repairs to a homeowner dwelling, if they substantially raise the dwelling's market value, result in property tax increases which the homeowner has to bear. For low and moderate income RRAP clients this presents a discouraging prospect. Because of the widely diverging property assessments between municipal areas across the country, RRAP homeowner clients face different tax adjustments as a result of rehabilitation." (Rostum 1978, pp.46).
6. Let us provide a hypothetical example to illustrate the contribution of rent increase towards the feasibility of rehabilitation investment. For a landlord to amortize a $10,000 investment in 25 years at an effective rate of 10% the monthly rent has to go up by $87.85. The amortization period can be viewed as the physical life of the rehabilitation work.

Finally monthly rent increase goes up as the amortization period declines and as the effective rate and original investment goes up.

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