THE EFFECTS OF LOCAL GOVERNMENT EXPENDITURES ON PROPERTY VALUES

by

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Abstract

This thesis examines the property value impacts of neighbourhood improvements to infrastucture provided by local government. The direct and indirect effects of a revitalization effort are studied in order to determine whether neighbourhood improvement programs generate positive spillover effects (externalities) to surrounding single family homes. These impacts are examined for a number of reasons: (a) property value determination studies have thus far omitted a treatment of detailed neighbourhood infrastructure variables; (b) the literature discussing externalities created by government intervention has either focussed primarily on the negative effects created by federal intervention, been theoretical in nature, or has been empirically inconclusive or contradictory; (c) the implementation of a neighbourhood improvement program in Canada was conceived of as a policy which would protect the investment of housing rehabilitation projects and has thus been expected to create positive neighbourhood effects.

The empirical analysis performed in this study examines neighbourhood improvements in general, and a neighbourhood improvement program in particular. The Canadian Neighbourhood Improvement Program (NIP) is empirically analyzed using multiple regression analysis. An analysis of covariance technique allows us to test whether neighbourhood improvements have a greater impact on housing values if they were provided in NIP designated areas or in NIP years.

The empirical results of this study indicate that there are

very few externalities created by the NIP program. In some cases, improvements were found to have a negative impact on single family house prices indicating that some improvements generate a negative effect. In addition, living adjacent to a NIP designated area was found to negatively affect single familly house prices in one of the study years. These findings imply that a justification for similar improvement efforts need to be based on something other than property value increases. Policy analysts should consider other economic and non-economic justifications for such efforts before embarking on similar programs.

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I. INTRODUCTION

1.1 Preface

One rationale for government intervention in neighbourhoods is the positive externalities assumed to be generated by such efforts. Whether direct or indirect benefits accrue to local residents is a question that should be of interest to a variety of groups; to government officials considering the efficiency of implementing a given program as well as the tax implications of such an effort; to financial institutions who may base their lending decisions on future projections of a neighbourhood's viability and value; to homeowners by creating a positive investment environment in which existing homeowners maintain their homes better and others find the neighbourhood more desirable to live or invest in.

One of the justifications for government intervention in housing is to ensure a "sufficient" housing stock. A housing stock is sufficient if there is enough of it and it is of an acceptable quality. Qualitative factors relate to such issues as fairness of distribution (especially as it affects the poor); market efficiency; special housing problems of select groups; and effects of monetary policies on the housing market requiring intervention.

A justification based on sufficiency may appear valid and reasonable, but there is little local housing market evidence that these objectives are being satisfied by intervention. Empirical evidence to date suggests that, at least at the

federal level, government intervention has not generated positive externalities for surrounding properties, significantly alleviated social ills, or raised property values for more than a very small area (Weicher). It is the latter issue of property value impacts with which this thesis is concerned.

It is the purpose of this thesis to evaluate empirically impacts of local government expenditures on neighbourhood improvements and to measure the resulting effects on property values. It has been suggested that since benefits of housing are primarily local, local officials are the appropriate ones to administer housing programs. To this end, two Vancouver, British Columbia neighbourhoods are studied: Kensington and Strathcona. Kensington and part of Strathcona are beneficiaries of neighbourhood improvements through a government program directed at stable but economically needy areas. This program is called the Canadian Neighborhood Improvement Program (NIP) and was instituted from 1973 to 1980. A multivariate analysis is conducted using the traditional structural and locational independent variables to explain single family house prices. In addition, local improvements to the infrastructure of these neighbourhoods will be included as explanatory variables. These improvements will be tested statistically for their differing effects before, during, and after the program years through the use of a set of interaction terms.

1.2 Research Objective And Framework Of The Study

In an attempt to answer the question of whether local improvements create positive externalities, the following questions will be addressed:

1) Do local government expenditures on neighbourhood improvements, whether NIP or otherwise, have a positive effect on single family property values?
2) Does designation as a NIP area by itself increase expectations as measured by increased single family property values?
3) Do the economic benefits of government expenditures on local improvements affect adjacent neighbourhoods?

The first question asks whether improving a neighbourhood's infrastructure will have price impacts, while the second question looks at whether targeting a neighbourhood for an improvement project by itself creates positive expectations which result in price effects. The third question attempts to address how wide an area specific improvements affect.

In this chapter, an introduction of the reasons for empirical research have been presented. A rationale for government intervention in neighbourhoods has been offered, and the objectives of property value determination emphasized.

Chapter 2 will review the literature by contrasting the needs of Canadian vs. U.S. city centres, and then provide a theoretical and empirical review of house price determination. Studies dealing with both qualitative and quantitative factors

will be covered to illustrate the range of variables that are typically treated in the literature. The role of expectations in the improvement process will be addressed because of their importance to creating externalities.

Chapter 3 will review NIP . It will provide a history of the program, describe the objectives and funding methods, and outline the improvement projects in each study neighbourhood. A brief explanation of NIP's companion program, RRAP, will be provided.

Chapter 4 describes the methodology and data that will be used in the analysis of the study neighbourhoods. The variables chosen and sources of data will be detailed. The test neighbourhoods will be described .

Chapter 5 presents the empirical results of this research, while Chapter 6 summarizes the implications of the findings, outlines limitations and sources or error, and recommends areas for further research.

II. LITERATURE REVIEW

2.1 Overview

The examination of central city revitalization in Canada is motivated by concerns specific to the characteristics of these cities. The needs of young, western central Canadian cities differ considerably from their U.S. neighbours. Unlike American city centres, Canadian cities experience almost no problems with ghettos and slums, and substandard housing is almost non-existent. According to Mark and Goldberg (1985):

> "The housing price trends of the 1970's and early 1980's suggest that there has been either a stable or excess demand for housing. The neighbourhood transition process referred to above for the U.S., to the degree that it might exist in Canada, appears not to be motivated by racial factors and/or the related outward movement of middle income households to the suburbs. Rather, it appears driven by rising expectations and excess demand, both of which represent different dynamics than are present in most U.S. central cities (p.30)"

Despite the fact that Canadian cities do not face the same problems of decay as American cities, many of the U.S. based studies presented in the following sections are relevant to the work done in this thesis. Methodologically, property value determination would be determined in the same way no matter what the motivating factors for inspection are. The primary difference between U.S. and Canadian models would be the importance of specific variables. The U.S. based models would emphasize the role of racial change, income, and large scale federal intervention on neighbourhood decline. In contrast,

Canadian based studies would be more concerned with smaller scale government involvement and the process of neigbourhood stability and improvement.

The need for government intervention in neighbourhoods as described by Mao (1965) is due to a failure of dynamic market forces. Mao asserts that:

> "the need for government assistance exists because of imperfections in the market mechanism:
> (1)the failure of the market mechanism to find expression for collective wants and
> (2)the failure of private costs and benefits to reflect accurately the true social costs and benefits of renewal activities (p.1)"

The objectives of a revitalization effort differ depending on the responsible government agency. According to Mao , the 1930's objective in the U.S was to raise property values in the city centres so that public housing would not be needed. At the same time, local governments had an interest in increased property values because they improved the fiscal position of the city. A much more indirect benefit was desired by other agencies. For instance, housing welfare groups wanted to improve housing conditions, social welfare groups wished to eliminat blight and prevent neighbourhood decline, and city planners saw renewal as a "way to reorganize metropolitan areas into a more rational,efficient, and aesthetically satisfying pattern (Mao,1965 p.2)."

There are two basic types of benefits that can be realized from an improvement effort. One, a direct benefit, is realized at the individual level. An indirect benefit is a societal

benefit which may also be viewed as an externality. In the context of housing rehabilitation, Tucker (1983) claims that indirect benefits are important for the implementation of government subsidized programs. Without them, the government must rationalize its expenditures in terms of benefits received by the individual recipient. The improvement to neighbourhood infrastructure does not occur at the individual household level. However, it does occur on a block by block basis, and so the question of whether externalities are created for surrounding blocks in the area is important.

2.2 Review Of Theoretical House Price Determination Studies

House price determination is important if one wants to evaluate the economic impact of any revitalization effort. The direct and indirect benefits discussed in the previous section can be studied to determine if the individual household is receiving property value increases or decreases due to an improvement effort, or if surrounding properties are similarly affected. While this type of analysis does not answer questions relating to social benefits such as crime reduction , or neighbourhood stability, a concrete dollar measure can indicate the direction of the impact. Further, tax implications to neighbourhood beneficiaries can be examined along with the implications of expanding the local tax base. By understanding which variables affect price, decision makers may then be able to implement more cost efficient programs.

The basic framework for the house price determination model in this thesis comes from early theoretical work dealing with

specific impacts on urban land and housing values. Of central importance to this early work is the role of the central business district in determining how much a particular user would pay for a designated location. The central business district is important since it evaluates the trade-off between land and house size and distances from work places.

The measurement of housing price determinants had its roots in von Thunen's classical transport oriented work (1826). In his model, von Thunen theorized that bidders for land were agricultural users whose bids depended upon the distance from the central marketplace to a specific site. Higher prices were commanded for the closer sites since transportation costs were lower. With the growing need to analyze urban development creted by various urban crises in the U.S., Alonso (1964) developed a mathematical model in which a household maximizes its utility subject to a budget constraint. He was able to examine how households with varying incomes were distributed around a city centre by modelling a series of bid rent curves to explain the combinations of land and distances from the central business district at which a household would be indifferent. The budget equation for the equilibrium solution of a household with income 'y' shows all possible ways the individual might spend his money (Alonso,1964):

"Y = PzZ + P(t)q + k(t) where

y : income;

pz : quantity of the composite good;

P(t): price of land at distance t from the center of the city

q : quantity of land;

k(t): commuting costs to distance t;

t : distance from the center of the city (p.21)."

At equilibrium, the slope of the bid price curve equals the slope of the price line indicating that a steeper bid price curve results when income increases. The conclusion that bid rent curves reflect the effects of tastes and incomes on distance is an important notion for this thesis since distance is a key element in the model used in this work.

It is not entirely clear from the empirical literature precisely what relationship distance has to house or land prices. In confirming Alonso's work, various analysts such as Brigham (1964), Mills(1969) and Quigley (1973) {see (Mark 1977b} suggest that distance from the central business district has a significantly negative impact. Others, such as Wilkerson (1974), and Berry and Bednarz (1975) found a positive relationship, while Anderson and Crocker (1971) and Kain and Quigley (1970) showed no significance. Mark (1977b) holds that a negative impact is much more likely to be found in a monocentric city than in a polycentric one.

While the work with distance was an important breakthrough in understanding price determination, more was to be done examining a broader range of factors. The importance of

including a range of locational factors in determining residential property values has been emphasized by Zerbst (1976) who breaks these factors down into accessibility and environment:

> "Examples of accessibility attributes for a residence are the distances (proxy for travel costs) to the central business district or workplace, schools, shopping centers, and recreational facilities. Other things equal, the more accessible a property is to these linked establishments, the higher the probable selling price (p.19)"

Environmental attributes of a neighbourhood are defined by Zerbst as externalities and may be grouped into three categories:

> "The first group, labeled 'physical environment' consists of man-made and natural physical attributes of the neighborhood. Examples of the physical environment are the size and conditions of neighboring dwellings, a scenic view, or a site adjacent to a lake or golf course.
>
> The second category of environmental location factors relates to characteristics of the people who live in the neighborhood and is called 'social environment'...The final category is labeled 'fiscal environment' and accounts for the public services available in the neighborhood and the corresponding tax liabilities. The perceived quality of local schools is an example of the fiscal environment aspect of location that plays an important part in residential purchase and pricing decisions (p.22)"

Zerbst and Eldred (1977) point out that home buyers,in making decisions, are really purchasing a 'bundle' of housing services and that the sales price of a dwelling unit is really a function of the physical, social and fiscal environments of the

location. The authors therefore argue that when these variables are omitted from a multiple regression equation, the physical characteristics of the properties themselves are forced to act as proxies--leading to insignificant or unstable results.

Another way to look at environmental attributes are as if they were amenities. An amenity as defined by Diamond (1982) is a location specific good such as air quality, views or local public services. Amenity analysis is important to policy and planning because governments use it to determine service and tax levies as well as to regulate and zone (Diamond 1982). Diamond suggests that:

> "Perhaps the most important reason for estimating the demands for amenities is the fact that many governmental bodies can and do influence the supply of those amenities. In the absence of competitive markets in the supply of 'neighbourhoods' or jurisdictions (e.g.As envisioned in a pure Tiebout, 1956 world), whether optinmal levels of amenities are provided depends on how well public decision makers can assess and respond to values that households place on them (p.18)"

The choice for households then becomes a question of buying either cheaper land or more amenities. If the Alonso-Muth-Mills model of location by income is generalized to take into account additional amenities (other than access to the CBD), then Diamond's equation takes the form:

> "Q =(l,s,f,a) where;
> L = land associated with the dwelling
> S = a vector of very durable structural characteristics
> F = a vector of infrastructure or less durable characteristics
> A = a vector of locational amenities (p.40)"

Diamond also suggests that increases in amenity levels tend to promote both maintenance and renewal. Thus, the same things that influence house prices also determine location patterns, maintenance and renewal, city size, and migration. Therefore, the "determination of the relative importance of individual amenities is a pressing empirical question and is a key to further development of analytically tractable yet realistic models of urban and regional economic phenomena (p.51)".

It has become clear from the literature that there are various factors which make a neighbourhood desirable. Researchers have identified these factors by defining the items that go into the consumer's housing purchase and location decisions. When a consumer buys a house, the common way of explaining his or her economic decision is to say that he or she is purchasing a bundle of goods. This theoretical bundle is comprised of a number of attributes. Physical attributes include traits such as number of rooms and number of square feet while neighbourhood attributes include such factors as socio-economic status of the residents, accessibility to work and shopping, and a certain level of public services. The purchaser chooses that bundle of attributes which suits his or her own preferences or budget constraint (Leven,et al 1976). Recently, micro-neighbourhood attributes such as visual quality, noise levels, pollution, and congestion have been referred to in the literature. When one looks at the decline of neighbourhoods, negative aspects of the bundle such as pollution or excess congestion are observed; if one is interested in renewal, means

are sought to manipulate the bundle to produce positive externalities. Improvements to a neighbourhood's infrastructure is one way government could manipulate the bundle to create positive externalities for residents.

2.3 Review Of Empirical House Price Determination Studies

The study of price determinants has expanded to test the significance of a number of possible models. Richardson, Vipond and Furbey (1974), tested four such models of housing price determinants: (1) a 'housing characteristics model' which used characteristics of the housing unit as the independent variable; (2) a 'pure spatial model' utilizing location of the housing unit in topographical and spatial terms; (3) an 'accessibility model' which looks at the traditional distance from the CBD as an independent variable and;(4) an 'area preference model' which evaluates neighbourhood quality factors. Having found that no one model adequately explained price, the authors suggest that researchers use a 'hybrid' when doing this kind of price determination work.

Mark (1977a) concurs with the conclusion of Richardson, Vipond and Furbey but adds that there is a better reason for testing a hybrid model:

> "Because many of the variables (at least in our study) are so highly correlated, it is not unusual to find one variable measuring the effect of another variable. For example, because LOTSIZE and DISTCBD are so highly collinear, we cannot conclude that the housing characteristics model (without DISTCBD) is measuring only the effects of the structural variables. Thus we need to estimate an equation that includes both LOTSIZE and DISTCBD so as to measure the effects of each standardised for each other (p.362)"

The theoretical and empirical work up to this point suggests that the most methodologically sound estimate of house prices employs a hybrid model using structural, locational, environmental, public service, and government externality characteristics. A variety of researchers have focused on one or more of these characteristics with varying results.

2.4 The Role Of Expectations

Mark and Goldberg (1982) evaluate the expectations created by government externalities in their Vancouver, British Columbia study of neighbourhood change. The role that public and private investment play in affecting house prices was the central theme of their paper which hypothesized that "expectation of improvement (or stability) should lead to increased investment...such investment would lead to increased improvement itself (p.11)". Since decisions to invest are usually based on the associated risk, the researchers set out to provide empirical evidence for the hypothesis that the larger the scale of government intervention, the more capricious the policies, and therefore, the greater the perceptions of increased risk. The smaller the scale, the less the perceived risk, and therefore, the less the likelihood of a negative effect on property values. They used public housing projects to represent a large scale intervention, and two locally oriented government programs, NIP and RRAP to represent a small scale effort.[1] Results of their cross sectional, multiple regression equations lend partial support for their hypotheses.

Mark and Goldberg (1984) elaborate on their earlier study

of the effects of RRAP-funded repairs on property values. In an effort to evaluate the positive or negative externalities created by government intervention, Mark and Goldberg tested the hypothesis that the sales price of a housing unit would be positively impacted due to RRAP funded repairs and that the sales prices of adjacent blocks would be similarly affected (a spillover or indirect effect). Using six cróss-sectional regression equations which include structural characteristics of the selling units and of the neighbouring units, characteristics of the neighbourhood, and RRAP and NIP funding, the authors conclude that RRAP funded repairs do not increase the value of the housing unit receiving nor the housing units adjacent to it. Definitive conclusions could not be reached as the R^2's of the equations ranged from .08 to .52. The low explanatory power of some of the equations could partly be blamed on the absence of local neighbourhood service variables and partly because of the turbulence of the housing market in Vancouver between 1979 and 1981. The cross-secional work in this paper was also not able to control for macro-economic factors such as interest rate changes that might affect prices over time or test for significant differences between years.

The importance of expectations as a dynamic in house price determination has been stressed repeatedly in research on neighbourhoods. As a variation of the Mark and Goldberg studies, a case study of a residential neighbourhood in Boston was carried out by Goetze (1979) who points to the role the media plays in influencing resident's expectations and showed

how these expectations, in turn, affected where people located and how their homes were maintained. Goetze asserts that conditions in the Jamaica Plain neighbourhood improved not because of an income change, but an attitude change. The author cites a 1973 study of a Federally Assisted Code Enforcement Program in Boston affecting absentee owners to illustrate the importance of neighbourhood confidence to the improvement process. Due to the Code Enforcement Program, longer term residents invested their own rainy day savings to improve their homes. The residents explained their behaviour by stating that, previous to the program, they had considered the neighbourhood a poor investment.

More research was done on the expectations process by Ahlbrandt (1979) who used regression analysis to evaluate the social fabric of six Pittsburgh neighbourhoods. The impacts of local government intervention on citizens' attitudes of satisfaction and commitment were evaluated. Results of the multiple regression analysis suggest that while local government may affect satisfaction by improving services to an area, and may positively influence investment in the housing stock, residents will not necessarily become more committed to an area. Ahlbrandt concludes that satisfaction and commitment are related to social fabric, neighbourhood conditions, neighbourhood facilities, public facilities, public services, and sense of community. Sense of community was the most important explanatory variable when it came to measuring commitment, while neighbourhood conditions as well as public services were a

significant predictor of citizen satisfaction. The author stresses that neighbourhoods need to be considered independently due to differences in perceptions of neighbourhood problems and priorities. Ahlbrandt suggests that a mechanism be found by which these problems and priorities are identified and communicated to city officials more efficiently.

Expectations play an important part in property value changes since the anticipation of a neighbourhood improvement or housing rehabilitation can cause investors and homeowners to value their properties more highly. Existing homeowners may take better care of their residences, while mortgage companies may be more willing to lend in a neighbourhood where the expectation is for stability or revitalization. Since positive expectations are hard to measure, their expression in terms of property value changes can be used as a proxy.

2.5 Property Value Determinants

In their empirical study of the determinants of real estate values in New Haven, Grether and Mieszkowski (1974) are motivated by their concern that specific policy changes are often advocated or opposed on the basis of protecting property values, and therefore, empirical research dealing with the actual determinants of house prices was needed. Physical characteristics of the house and some features of the neighbourhood were used in a multiple regression equation which could be influenced or controlled by local governments (i.e. zoning codes, routing traffic, allocating services, reading percentile, pupil-teacher ratio). Using disaggregated data,

their regression results suggest that zoning changes do not necessarily lead to an increase in traffic, which would then be expected to negatively impact property values. The effects of reading percentile and pupil-teacher ratios were both highly significant, indicating that the quality of neighbourhood schools has a positive impact on prices of neighbourhood homes.

Studies dealing with the determinants of land or housing values have long pointed to qualitative factors as being as important as some of the quantitative ones. For instance, Brigham (1965) used multiple regression to estimate land values in Los Angeles. His equation took the form:

Land Value = f(P,A,T,U,H) where

P = accessibility to economic activities

A = topography

T = present and future use

U = industrial, commercial or residential use

H = historical factors that affect utilization

Three equations were designated to account for the differential effects that were dependent on land use (U). The key variables were combined into an index such that a site's accessibility becomes a function of proximity to different activities as well as the transportation system that connects it. Social and atmospheric conditions were combined to determine an amenity index. Amenity levels included qualitative factors measured subjectively through a ranking system (i.e. smog). The results of the multiple regression analysis

indicated a positive relationship between land values and accessibility but these results were unstable for different samples. Multicollinearity was a serious problem in this study as many of the proxies used for the independent variables were highly correlated. The study also suffered from the fact that data was taken from tax assessment appraisal records which may not have indicated the true value of the land in the market. In addition, sample points were blocks (using average appraised value per square foot for the block) which is not an ideal method of evaluating micro factors in a neighbourhood. The author pointed out that a major weakness of his work was difficulty in measuring qualitative factors such as atmospheric conditions or topography that may have been affecting land values. These factors can only be understood at an intuitive level.

Other researchers share the view that qualitative factors are important, if not measurable determinants of value. Kain and Quigley's (1970) study using qualitative and quantitative dimensions via factor analysis found that "the quality of the bundle of residential services has about as much effect on the price of housing as objective aspects as the number of rooms, number of bathrooms, and lotsize (p.544)." Reinforcing this view are Li and Brown (1975) who tested the impact of micro-neighbourhood externalities on property values using hedonic prices. The quality of the school system was cited as the most important public service in the household's location decision. They also found that including accessibility to non-residential

land uses had a positive effect on house prices, while externalities such as pollution, congestion, and unsightliness had a negative effect.

2.6 Public Services And Tax Effects

Research on the effects of public services such as parks, schools and recreation on property values and taxes yield inconclusive results. Hendon (1971) finds that whether parks exert a positive or negative impact on properties close to the park depends on the positioning of the property. Further, the greatest impact is on land value rather than house value. Hendon concludes that there is no need for special tax assessments on properties near the park since fair market value should take the impact of the park into account. In a later study, Hendon (1973) tests the hypothesis that park-school combinations increase adjacent property values. The results of his multiple regression equations reveal that if the park is well developed and aestheticaly pleasing, there is some promise that park- school combinations can have a positive effect, diminishing the nuisance value of schools. Schools alone tend to reduce property values of adjacent neighbourhoods.

McDougall (1976) empirically tests the effects of local public services on housing values, concluding that households place a higher value on education and police services than on parks and recreation and fire protection. He finds that property values are not only affected by the availibility of local services and the property tax rate, but they in turn affect the property tax rate and the output of local public

services.

Oates (1969), in his empirical study of tax capitalization and the Tiebout hypothesis uses a cross-sectional analysis of a sample of communities to examine the relationship between property values and local property taxes and expenditures. Results show, holding all else constant, that property values and the property tax rate have a significant negative relationship as do property values and expenditure per pupil. The author further concludes that there is a partial capitilization of the tax. The evidence suggests that the benefit from an "expansion in spending on the local school system approximately offsets the depressive effects of the higher taxes required to finance the expanded program (p.967)". These results are consistent with the Tiebout hypothesis in which "rational consumers weigh (to some extent), the benefits from local public services against the cost of their tax liability in choosing a community of residence; people do appear willing to pay more to live in a community which provides the same program of public services with a lower tax rate (p.968)".

Oates' work was important in that it tested the Tiebout hypothesis which sets out the relationship between local public services and tax liablities. However, Pollakowski (1973) points out problems in Oate's study including choice of local government variables, the interelationship among variables, possible suppressed variables, and choice of sample.

Weicher and Zerbst (19373), in a study of five parks in Columbus Ohio, attempt to identify people who benefit from

externalities. The relationships between externalities and assesed values are studied using least squares regression. Results clearly indicate that neighbourhood parks generate externalities for surrounding properties but the relationship depends on where the property is situated vis-a-vis the park. On the basis of this research, Weicher and Zerbst conclude that parks should be publicly provided in the interest of economic efficiency (total social benefits=total social costs). The authors claim that tax assessors fail to recognize positive externalities. The validity of this research is questionable since the sample size was too small and since actual selling prices are more accurate than the assessed values upon which the conclusions were based.

2.7 Government Programs And Spillover Effects

The spillover effects of government programs have yet to be determined. Nourse (1976) cites studies indicating that "improvement in housing is unlikely to have an impact on neighbourhood property values unless other market changes are present... socio-economic class of families in a particular neighbourhood is more important than quality of structure in determining neighbourhood house values (p.250)."

Goetze and Colton (1980) studied housing programs and concluded that the 1960's programs for new housing and rehabilitation were unsuccessful because they undermined neighbourhood confidence. In order to achieve the desired revialitzation, the authors urge that housing strategies be combined with programs that instill this confidence. Varady

(1982) points to the possibility that housing programs can promote positive spillover effects on property values by reducing uncertainty among investors and current homeowners. Positive spillovers to surrounding areas are more likely to be observed when programs are structured to fit the needs of particular neighbourhoods. Even still, the geographic impact of most housing programs is expected to be very limited.

2.8 Summing Up

A study examining the effect of local government expenditures on property values must take into account the role governments play in influencing expectations. Governments may affect a neighbourhood's confidence and investment behaviour by manipulating selected externalities. In this thesis, improvements to neighbourhood infrastructure are examined and the resulting effects on property values analyzed. Property value increases or decreases due to neighbourhood variables may be seen as a reflection of the expectation process due to a change in the housing bundle.

Methodologically, property value determination is best carried out using a hybrid model which seeks to include as many attributes of the housing bundle as possible. Multiple regression has been used by most authors with varying specifications. The difficulty arises in defining qualitative factors in a neighbourhood which cannot be directly observed or measured.

Past empirical research has focused on a broad range of micro variables. The role of school quality, parks, pollution,

congestion and level of public services have all been examined. The results are far from conclusive or generalizable due to measurement problems of these studies. As yet to be explored are the effects of micro neighbourhood improvements (provided through a local government program) on actual sales prices. These improvements would include such expenditures as street paving, lighting, curbs, sidewalks and trees, as well as recreational and social improvements such as playgrounds, community houses and park amenities. As a natural extension of the neighbourhood characteristics model, this analysis would provide a more detailed explanation of price determination as well as an indication to local government of possible impacts of neighbourhood renewal policies.

NOTES

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[1] NIP is the neighbourhood improvement program examined in this thesis which provides improvements to a neighbourhood's infrastructure (i.e. paving, sidewalks, curbs) . RRAP is the Residential Rehabilitation Assistance Program which represents another local government intervention that provides money to qualified households in order that they can repair and upgrade structural elements of their housing units.

III. IMPROVEMENT PROGRAMS IN CANADA

3.1 The Neighbourhood Improvement Program

The Neighbourhood Improvement Program was enacted by Parliament in June 1973 along with the previously mentioned Residential Rehabilitation Program (RRAP) in order to revitalize declining inner city neighbourhoods. The two programs represent a comprehensive attempt to upgrade deteriorating urban areas. The RRAP was aimed at improving the physical structures of residences while NIP was in place to improve the physical environment surrounding these homes. The emphasis of NIP was:

> "...conservation and rehabilitation of existing neighbourhoods and the provision of amenities in these communities. The program was designed to provide resources in accordance with both financial planning and continuous planning for the area. It provided for resident participation in the planning and implementation of neighbourhood improvement activities (The Impact of the Neighbourhood Improvement Program in British Columbia, 1980)."

3.2 History Of NIP In Vancouver

The NIP program in Vancouver evolved from earlier urban renewal attempts to revive deteriorating neighbourhoods within the city. In particular, the program was largely modelled after an earlier rehabilitation scheme in Strathcona.

Strathcona, one of the areas of study in this paper, became a primarily Chinese neighbourhood after World War II. The neighbourhood had many long term residents, but was physically run down. Strathcona was designated for urban renewal in 1958

as part of a North American effort to ameliorate the problems of blighted inner city areas. The approach to urban decay at this time was to demolish older, deteriorated housing in order to make room for public housing. As a result of these efforts in Vancouver, by 1965, over one thousand residents were displaced and the Maclean Park and Raymur Place Public Housing Projects were constructed. Leaders and residents of Strathcona protested against this type of renewal on the grounds that it resulted in tremendous social, psychological, and economic costs. Lobbying efforts by local residents led to the formation of the Strathcona Property Owners and Tenants Association (SPOTA). SPOTA provided a forum from which residents could voice their convictions that the city and federal governments should direct their efforts toward saving and improving existing structures and neighbourhoods rather than replacing them with public housing.

With many blighted Canadian communities protesting the bulldoze-and-redevelop approach to urban renewal, the federal government froze funding for these projects in 1969. Accordingly, the next step for Strathcona was a rehabilitation project which involved all three levels of government as well as SPOTA. Five million dollars were spent on hard services such as sewer and water mains, streets, sidewalks, lighting, tree planting, and grants and loans to homeowners for repair and renovation. This increased confidence in the future of the neighbourhood so much that "privately funded rehabilitation took place, new infill family housing was built, and homes were

better maintained (Vancouver City Planning Deptartment, 1974)". The success of the SPOTA project was partly attributed to the active involvement of local residents. When the federal government ultimately developed the NIP program, it was conceived with the same resident level involvement in mind.

In 1970, a Community Improvement and Development Program was recommended in a Vancouver urban renewal study as an alternative to renewal which would build on functioning neighbourhoods. The city developed an area planning program which attempted to work with the entire spectrum of physical and social variables that affect the quality of a neighbourhood's environment. Twenty two local areas were delineated by examining each neighbourhood's social and economic characteristics, residents' perceptions of their communities, and exisiting administrative boundaries used by governmental agencies. Once an area was determined to be stable, a plan was implemented which would further the goals of improving a neighbourhood's social and physical amenities,as well as improving housing conditions. After the adoption of amendments to the National Housing Act, a comprehensive program known as NIP was created to improve existing neighbourhoods across Canada modelled on the Strathcona approach.

3.3 Description Of NIP

In general terms, NIP provided loans and grants as needed to support the rehabilitation plan that ultimately was developed in each NIP designated area. An annual agreement between CMHC and each participating province set out the basic allocation, as

well as guidelines for neighbourhood designation. CMHC greatly de-emphasized planning, especially the scale of planning that characterized the urban renewal program. Federal funds for the planning stage were not to exceed eight percent of the total Federal allocation of the municipality involved. Instead of a prominent planning role, a citizens' committee was formed in each neighbourhood, and a few city planners assigned to advise and guide the committee members as needed. The committee had the specific responsibility of expending allocated NIP funds in the best interest of the community. From this effort, a concept plan is developed, and the project activities implemented.

The senior levels of government were ready to begin utilizing NIP on December 18, 1973 and it was decided that NIP should stress an active approach on the part of residents . Social programs were determined to be a legitimate cost item if they were essential for the area's stability. The following variables were considered when choosing eligible neighbourhoods:

(1) communities with older housing in need of major repair;
(2) low to moderate income;
(3) substandard recreation facilities; and
(4) inadequate municipal services (i.e.streets, sidewalks, water lines.)

According to the NIP Operators Handbook (CMHC,1975), the following were goals of the program:

"1. To improve those residential neighbourhoods which show evidence of need and potential viability.
2. To improve and maintain the quality of the physical environment in the neighbourhood.
3. To improve the amenities of the neighbourhood.
4. To increase the effect of related programs.
5. To improve the neighbourhoods in a manner which meets the asprations neighbourhood residents and the community at large.
6. To deliver the program in an effective manner. (CMHC Operators Handbook, 1974)".

In concert with the RRAP which was designed to finance housing rehabilitation , NIP provides grants and loans to improve physical facilities. The program guide also states that it is the intent of NIP to:

" conserve and rehabilitate the housing stock (through the companion Residential Rehabilitation Assistance Program);
to add or rehabilitate required social and recreational amenities or municipal services;
to remove bligthing land use;
and to promote the maintenance of the neighbourhood after the NIP project is terminated."

One of the few program requirements for the designation of neighbourhoods is that at least $100 per neighbourhood resident be budgeted from the program allocation. This establishes a floor governing neighbourhood size, and is designed to address the critical mass problem which all neighbourhood redevelopment efforts struggle with. CMHC also recommends that neighbourhoods receive a minimum of $150,000. The average funding level by 1976 was nearly $548,00 per project area.

The 1977 profile of an average neighbourhood which receives assistance is provided in a 1978 report by CMHC (Revitalizing North American Neighborhoods, 1978):

Average neighbourhood population .....2,912 persons
Average NIP area household income.....$8,148/annum
Average city household income.....$9,225/annum
Percent owner-occupied housing.....48 percent
Percent units needing rehabilitation.....45 percent
Average acreage per NIP project.....365 acres
Dwelling units per project.....831 units
Average per capita Federal contribution.....$176

The funding for NIP comes from three levels of government--federal/ provincial/municipal. Cost sharing can be broken down as 50%/25%/25% respectively for most improvements, but for contributions made towards improving municipal and public utility services or for acquiring and clearing land that does not qualify under the first formula, the breakdown is 25%/12.5%/62.5%.

According to a 1980 report published by the Vancouver City Planning Department, the NIP and RRAP programs resulted in :

> "negative influences such as excessive redevelopment and through traffic have been contained. Community confidence and participation have replaced apathy and uncertainty.The public money invested directly by NIP and RRAP has been the catalyst for substatial additional investment from private and other sources (Vancouver City Planning Dept, 1980)".

3.4 Study Neighbourhoods

Two of the neighbourhoods under study in this paper, Kiwassa (a section of Strathcona) and Kensington were recipients of NIP benefits during the years 1977-1981.

The neighbourhood improvements to Kensington will be

described first, followed by the improvements provided for Kiwassa.

A number of recreational and social facilities were provided by NIP funding. The largest facility completed in Kensington was the Kensington Community Centre which has an indoor swimming pool, two squash courts, meeting spaces and an excercise room. It was officially opened in June of 1980. Membership grew from 500 to 2000 in the first six months of completion. Gray's Park Community House was the next largest project which serves the public as a meeting place (especially for senior citizens) as well as a recreational facility for local lawn bowlers. A storefront library was a much needed improvement provided by NIP since the neighbourhood was previously lacking any library facilities. Park improvements included Gray's Park which received a new community house, lawn bowling greens, an adventure playground and walking paths. Kensington Park received two self-draining playing fields worth in total $250,000. The park was not available for use until 1981. Glen's Park and Kingcrest Park also received landscaping, play areas, or washroom improvements.

Other physical improvements to the neighbourhood included trash cans, a pedestrian crosswalk across Knight Street, sidewalks, and school ground improvements. A community gym was being designed as of July 1980. Project descriptions and a breakdown of costs are shown in Table I. The improvements listed were highly varied in order to benefit as many age groups as possible. The greatest benefit should be felt by those

involved in sports as well as by senior citizens.

The neighbourhood improvements also served as catalysts to other types of programs. A grant called New Horizons was provided to senior citizens to operate programs out of the new community house. Three Young Canada Works grants were awarded because of the NIP effort.

There were fewer projects completed in Kiwassa due to the smaller size of the neighbourhood. The residential properties of Kiwassa were rezoned from M-1 to RT-3 before a concept plan was approved. The concept plan itself was approved by City Council in April 1978. One of the goals of this area was to maintain the general mixture of compatable housing and industry.

Major recreational improvements to the area include the Kiwassa Neighbourhood House which has programs centered on children and ethnic groups of the community. The Seymour School Playground was converted from a barren playing field to a grassed-in rest area with a large play structure and tot play equipment. A landscaped mini-park was constructed on Keefer Street with a carved wooden archway. Blossoming pink Japanese cherry trees were planted at the request of local residents.

Physical improvements to the area include street lighting replacement to match Strathcona lamps. Paving, curbs and sidewalks were provided to help defray the usual property owners' portion of 2/3 of the project cost. An overpass enclosure was provided to improve crossing conditions. Table II provides a cost breakdown for each recreational and physical improvement described above.

3.5 Description Of RRAP

The RRAP program is a companion to NIP, and has been used in about half of all NIP designated areas. The rationale for these two projects working together is that RRAP assistance rehabilitates deteriorating housing stock in order to extend its life by an additional 15 years, while NIP protects this investment by improving the infrastructure of the neighbourhood. RRAP provides loans of up to $10,000 per unit (not exceeding the cost of repairs) at a preferred interest rate. Homeowners with adjusted family incomes under $6,000/annum are eligible for a maximum loan forgiveness of $3,750 if they continue to own or occupy the housing unit after the work has been completed.

A 1978 profile of the average loan assistance to homeowners reveals that:

(1) The average loan was over $3,900/unit.

(2) The average loan covered 90% of rehabilitation costs.

(3) About 63 percent of all homeowners receiving RRAP of the remaining having moderate incomes.

(4) About 41% of loan recipients were elderly, while 39% had one or more dependents.

(Revitalizing North American Neighborhoods, 1978).

In addition to private homeowners, landlords, non-profit corporations, and housing co-operatives may also qualify for funding.

Although the NIP program was terminated in 1981, RRAP remained as one of the most substantial housing conservation

programs in Canada. It is for this reason that the effects of RRAP cannot be wholly separated from the effects of the NIP improvement effort.

Table I - DESCRIPTION OF IMPROVEMENTS AND COST BREADKWONS-KENSINGTON

SOCIAL AND RECREATIONAL FACILITIES(50/25/25)

PROJECT NAME:		CMHC	PROV	CITY	TOTAL
Six litter containers					
NIP	979	488	244	244	976
Windsor United Church					
NIP	18,463	9,231	4,615	4,615	18,461
First Church of Nazarene					
NIP	5,102	2,551	1,275	1,275	5,101
Tecumseh School Annex Ground Improvements					
NIP	18,300	9,150	4,575	4,575	18,300
Dickens School Annex					
NIP	10,439	5,219	2,609	2,609	10,437
S.Bd.	2,719				
Selkirk School Annex Playground Improvements					
NIP	12,982	6,491	3,245	3,245	12,481
S.Bd.	2,330				
Richard McBride School Annex Creative Play Area					
NIP	10,169	5,084	2,542	2,542	10,168
S.Bd.	2,542				
total:	17,454				
Glen Park					
NIP	63,361	31,680	15,840	15,840	63,360
Kingrest Park					
NIP	156,626	77,813	38,906	38,906	155,625
Gray's Park Community House and Park Improvements					
NIP	187,258	93,629	46,814	46,814	187,257
Canada Works	24,839				
New Horizons	9,415				
Park Board	5,000				
total:	173,644				

TABLE I CONTINUED

PROJECT NAME		CMHC	PROV	CITY	TOTAL
Kensington Park Community Centre					
NIP	1,181,289	590,000	29,532	29,532	649,064
	7,500				
Total:	1,188,789				
Kensington Community Library Leased Space					
NIP total	105,000	47,142	23,572	34,285	104,999
TOTAL :		878,478	173,769	184,482	1,236,729

SERVICES AND UTILITIES(25/12.5/62.5)

PROJECT NAME:		CMHC	PROV	CITY	TOTAL
Property purchase for street widening purposes					
NIP	2,800	700	350	1,750	2,800
Sidewalks around parks					
NIP	32,771	8,192	4,096	20,482	32,770
city cap	122				
Pedestrian signal					
NIP	15,000	3,750	1,875	9,375	15,000
TOTAL:		12,642	6,321	31,607	50,570

ADMINISTRATION(50/25/25)

Planning NIP	47,904				
Implementation	19,465				
total:	67,370	33,685	16,842	16,842	67,370

*source (Vancouver City Planning Dept, 1980)

Table II - DESCRIPTION OF IMPROVEMENTS AND COST BREAKDOWNS-KIWASSA

SOCIAL AND RECREATIONAL FACILITIES (50/25/25)

PROJECT NAME:		CMHC	PROV	CITY	TOTAL
Kiwassa Neighbourhood House					
a. Bldg.Construction		119,281	59,640	59,640	238,561
NIP	238,563				
City Sup.Cap.	39,000				
Private Funding	41,500				
b. Equipment and Furnishings					
NIP	1,720	860	430	430	1,720
Unnappropriated city NIP	14,294				
total:	335,078				
Seymour School Playground		14,096	7,048	7,048	28,192
NIP	28,192				
Canada Works	14,652				
School Board	11,000				
total:	53,844				
Keefer Street Mini-Park and Archway		15,029	7,514	7,514	30,059
NIP	30,059				
Street Tree Planting		10,626	5,313	5,313	21,252
NIP	21,252				
	TOTAL:	159,892	79,945	79,945	319,784

TABLE II CONTINUED

SERVICES AND UTILITIES(25/12.5/62.5)

PROJECT NAME:		CMHC	PROV	CITY	TOTAL
Strt.Ltg. Replacement		1,671	835	4,179	6,686
NIP	6,686				
Paving,Curbs,Sdwlkss		16,314	8,157	40,787	65,259
NIP	65,259				
city capital	134,086				
property owners	81,330				
total:	280,676				
Keefer Street Overpass		6,000	3,000	1,500	24,000
NIP	24,000				
ciy non-shareable	12,573				
total:	36,573				
TOTAL :		23,985	11,992	46,466	95,945
PLANNING					
NIP	15,105	7,552	3,776	3,776	15,105
IMPLEMENTATION					
NIP	17,449	8,749	4,374	4,374	17,449
city capital	32,027				

*source (Vancouver City Planning Dept, 1980)

IV. THE STUDY AREA AND METHODOLOGY

4.1 The City Of Vancouver

This study focuses on two areas of Vancouver, British Columbia. Vancouver is Canada's third largest urban area. As British Columbia's major urban centre, it boasted a city population of 414,338 in 1981. The city's residents are mainly of British origin (69.6%), followed by Chinese (7.8%), and to a lesser extent Slavic, Hispanic, Indo-pakistan, German and Italian. Figure 1 shows the Vancouver local areas, graphically illustrating the relationship of the study areas to the city at large.

4.2 Strathcona-Kiwassa

Strathcona is a primarily Chinese community in which property values and rents have traditionally been lower than the city average. There exists a pattern of relatively debt-free, self-owned homes in this low-income neighbourhood.

Kiwassa, which represents a portion of Strathcona, is the area which received NIP funding. This area is NIP's smallest--containing only 95 residential buildings and 400 people. Bounded by Clark Drive at the West or East, Venables on the South, and astings on the North, it contains nearly 23 acres. The area is 52% single family, conversions and apartments; 22% schools and a neighbourhood house; 21% light industrial or warehouse; and 5% vacant.

Demographic statitics indicate that approximately 6% of the population is Chinese. The area contains some of the oldest

homes in the city, some dating back as far as the late 1880's. More than 75% of the residential units are owner occupied.

As a result of neighbourhood problems, the elementary school (Seymour School) witnessed an enrollment decline from a high of over 800 to a low of 340 in recent years. The residents hoped to gain residential stability through NIP in order to keep a steady number of children within the area. Another problem within the neighbourhood is that household incomes are well below the city average. In 1977, 46% of the household incomes were less than $6,000/year with 82% being less than $16,000. The city as a whole had only 18% of yearly incomes less than $6,000 and 64% with incomes less than $16,000.

The neighbourhood has a number of ongoing concerns. One stems from the traffic impacts of B.C Place and Expo '86 since these projects are adjacent to the neighbourhood and are likely to generate a fair bit of disruptive traffic. Another concern is the preservation of heritage, school and cultural characteristics. Since the community has a strong Chinese identity, this is an important issue for the residents. The residents also mention an interest in maintaining open space and linear park links, and addressing social problems such as crime and the need for programs to occupy the youths of the neighbourhood.

4.3 Kensington

Kensington is a triangularly shaped 21 hectare area in the eastern central corridor of Vancouver. All of the boundary roads are very busy commuter and commercial arteries. Knight Street is one of the city's designated truck routes which runs north-south, physically cutting the community in two. According to a 1980 CMHC report, the busy Knight Street divider does not create an east-west barrier in the minds of residents. The area is bounded on the northeast by Kingsway Boulevard, on the west by Fraser Street, the east by Nanaimo Street, and to the south by Forty Ninth Street.

Kensington, in contrast to Strathcona, is primarily made up of white Anglo-Saxons(69%). Minority groups include Chinese (11.5%), Italian (3.4%), Indo-Pakistan (2.8%), Portugese (3.2%), Slavic (3.6%) and German (4.2%).

As an indication of this neighbourhood's stability, Kensington's population increased by 1% between 1976 to 1981 which is comparable with the city-at-large. Furthermore, as of 1976, almost 43% of the residents had lived in the area for more than ten years.

Demographic statistics indicate that Kensington is a working class neighbourhood with 23% of the area's population under the age of 19 compared with a 1976 city average of 24%. The average income of $9,000 in 1976 in this neighbourhood was well below the city average.

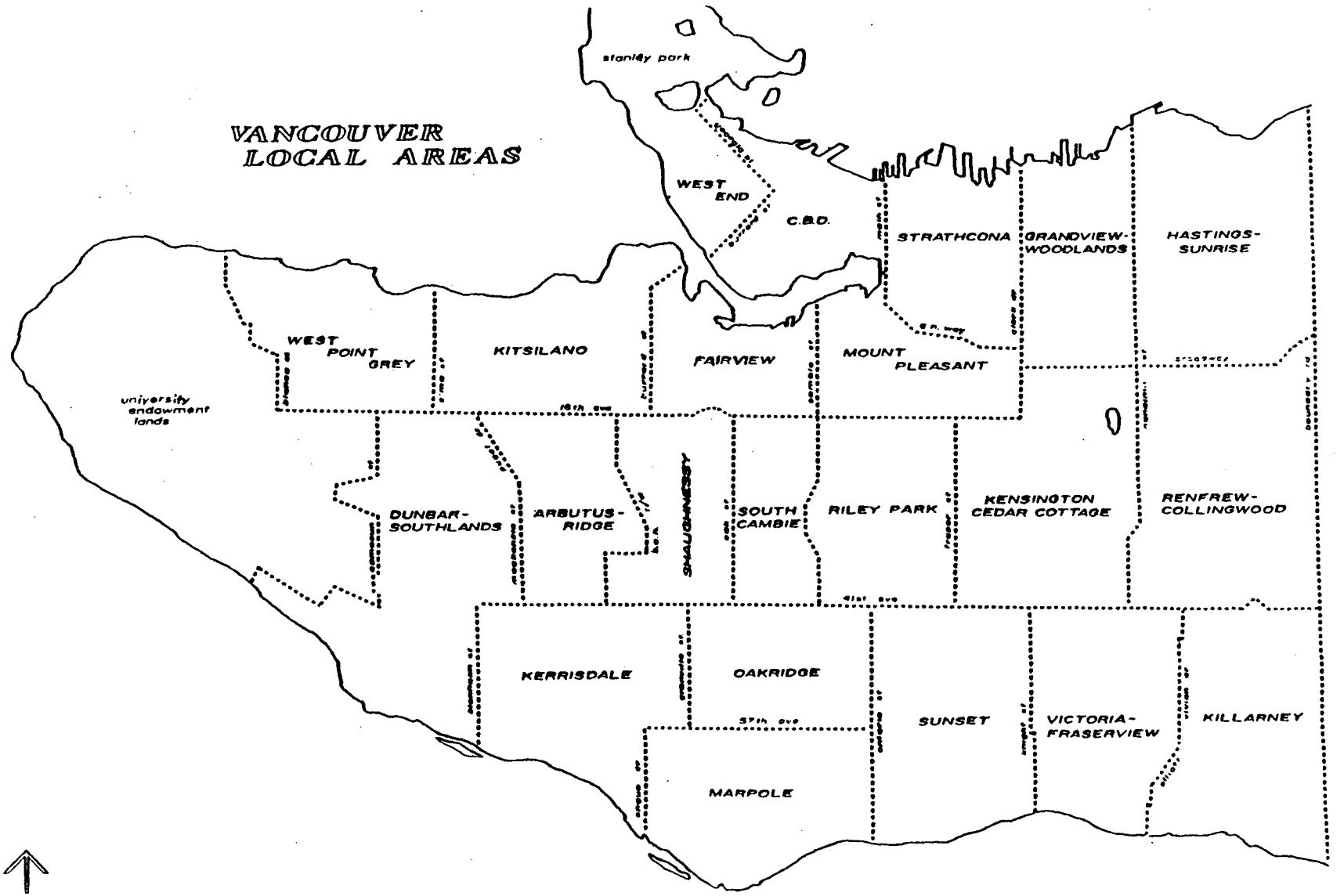
Kensington is a primarily single family residential area (73%). Commercial establishments make up 7% and duplexes or

apartments make up 5%. The remainder of the area is taken up with parks, schools and services. There are 4500 dwelling units, 75% of which are owner occupied. One quarter of these units were built prior to 1940, and are in need of rehabilitation according to a 1980 CMHC report.

Kensington is served by four parks which encompass 12 hectares of land. Prior to the NIP improvements, the playgrounds on these parks were run down and the turf on the playing field was of poor quality. The community only has one school (Sir Richard McBride) and four annexes that serve as schools. Due to the lack of a community centre, the city had to contract recreational activities to churches and schools.

To further illustrate the need for infrasturcture renewal, 47% of the neighbourhood's streets were without curbs, paving, or sidewalks.

Figure 1 - Vancouver Local Areas



4.4 The Data

The primary data base used in this study was obtained from the files of the British Columbia Assessment Authority, the body charged with determining assessed values throughout the province each year. For each and every housing unit in Kensington and Strathcona dating back to 1957, detailed information is provided on structural characteristics, improvements to the unit, zoning restrictions, location, and actual arms length transaction prices. Neighbourhood data on schools (SCHOOL) and parks (PARK) were generated from map observations obtained through the Vancouver City Engineering Department. Using a scale of 1:400, these maps show the district lot and block numbers for all parcels in the study area as well as the location of schools and parks. The DISTCBD variable indicates the distance from the city centre and was created from the same maps on a block by basis, by calculating the distance from the corner of Granville and West Georgia Streets to the centre of the block where the parcel is located. The smallest measurements used were 200 feet which allowed for close accuracy.

The data base was then supplemented by information on NIP improvements during the program years. In most cases, the approximate date of completion is provided for improvement data. This data, taken together with the primary data base, represents a fairly comprehensive description of the physical characteristics of the housing units in question, relevant neighbourhood infrastructure improvements, and their transaction histories.

The variables used in this analysis appear in TABLE III. The names of the variables, their definitions, and direction of expected impact on sale price (expected sign) are provided. Block face is defined as the same side of the street as the housing unit impacted, while block is defined as both sides of the street. Dollars spent on recreational improvements are defined as either major or minor, depending on whether more than $20,000 were spent on the improvement. These improvement variables (DOLRSOCF, (DOLRSOCA) are coded in the same way as dummy variables. A zero indicates that less than $20,000 was spent (a minor improvement), while a one would indicate that more than $20,000 was spent (a major improvement).

Although the coding may differ slightly, most of these variables are fairly typical of those utilized in housing price regression studies. For instance, the variables describing physical characteristics are fairly standard. However, instead of using number of bathrooms per unit, the number of plumbing connections (PLUMB) is substituted. The PLUMB variable, as well as other physical characteristics variables such as presence of garage (GARAGE), basement (BSMNT), number of rooms (ROOMS) , and lotsize (LOTS) are all expected to exert a positive impact on house price. Age, on the other hand, would be expected to exert a negative influence, while the impact of gas as opposed to other types of heating is unknown. Under the zoning and neighbourhood variables section, school (SCHOOL) and parks (PARK) have question marks beside them since the literature is inconclusive as to their impacts. Also uncertain are the

effects of nonresidential zoning in the neighbourhoods, high density zoning, rezoning allowing a change in use or an increase in density. Although land use in general is an important determinant of value, it is uncertain what the precise influence will be in these neighbourhoods.

In this particular study, DISTCBD is expected to have a positive effect on price . As one moves further away from the downtown core, property values would be expected to increase since proximity to the core is associated with negative externalities such as higher density, increased traffic and light industrial zoning.

The variables used to test for government externality effects were NIP and NIPADJ. NIP, which designates whether a block is in a NIP area, is hypothesized to have a positive impact on price due to an increase in expectations of residents. NIPADJ, which indicates closeness to a NIP area, has an uncertain sign because it is unknown whether any benefits from surrounding areas will be strong enough to spill over.

The improvement variables are coded both as dummy variables and dollars. The dummy variables simply indicate whether or not an improvement has taken place (i.e. a tree has been planted, a curb installed, etc.) while dollar variables indicate how much was spent on each improvement per block. The dollar variables are considered to be a finer measurement since they get at the quality level of improvements. In the analysis, dummies and dollars are treated in separate equations since they are not independent of each other.

The expected signs for most of these variables are positive. The effects of trees is unknown since the size and aesthetic character cannot be measured. Also, it is uncertain whether the trees would affect any houses other than the ones on the block face. Pavement, curbs, sidewalks, and streetlighting are all expected to have a positive impact since they improve the ambience and safety of a block. The corresponding dollar variables for these improvements are also expected to have a positive impact since the more money spent on a block, the more substantial the improvement is considered to be. Dummy or dollar variables for the opposite of the block face have question marks because it is uncertain whether these improvements impact any properties other than those they directly touch. The signs for interaction terms are likewise questioned because it is unknown a priori what difference these will have compared to the base year. Lane paving could exert a positive or negative influence depending on whether it improves access to garages for area residents or creates negative externalities by allowing for increased traffic throughout the block.

In general, one would expect large capital improvements to exert a more meaningful influence than mere upgrading of existing streets. Recreational and social improvements on the block face (RSOCFACE) may exert a positive or negative influence depending on whether negative externalities are created by living directly in front of a new community house or park improvement. Recreational and social improvements on adjacent

blocks (RSOCADJ) would be expected to have a positive influence because of the increased amenity level provided for the neighbourhood.

In summary, the data described here provides a comprehensive description of housing units, of their neighbourhoods, and of their exposure to the NIP program. Neighbourhood improvements are provided on a block by block basis and provide information through dummy variables (0 if not present, 1 if present) and dollars (actual amount spent on improvement per block). Socio- economic information is absent because this information is only provided in census years (every 5 years) which is inconsistent with the annual data used here. Since the neighbourhoods in question are both lower income stable working class areas, lack of demographic information is not considered to be too serious. The large data set provided, as well as a methodology that improves on similar studies will yield new insight into the external benefits of a neighbourhood improvement effort.

Table III - VARIABLES AND EXPECTED SIGNS

VARIABLE	SIGN	DEFINITION
CONPRICE (A)	Dep Var	actual selling price of unit in constant 1981 dollars
	STRUCTURAL VARIABLES	
AGE	-	age of housing unit in years
ROOMS	+	number of rooms
LOTSIZE	+	lot area in square feet
PLUMBS	+	number of plumbing connections
BSMNT	+	dummy variable for the presence of a basement (1=yes,0=no)
GARAGE	+	dummy variable for presence of garage (1=yes,0=no)
HEAT	?	dummy variable for type of heating system (1=gas,0=other)
	ZONING AND NEIGHBOURHOOD VARIABLES	
DV71 TO DV82	?	dummy variable for each year indicating whether the sale was in that year
SCHOOL	?	dummy variable indicating if school is on block or block face (1=yes,0=no)
D71SCH TO D82SCH	?	interaction variables between years and SCHOOL
PARK	?	dummy variable indicating if park is on block or block face (1=yes,0=no)
D71PRK TO D82PRK	?	interaction variables between years and PARK

TABLE III CONTINUED

NONRES	?	dummy variable indicating at least one parcel on the block or block face is zoned for nonresidential use (1=yes,o=no)
D71NRS TO D82NRS	?	interaction variables between years and NONRES
HIGHDEN	?	dummy variable indicating at least one parcel on the block or block face is zoned for higher density residential units (1=yes,0=no)
D71HDN TO D82HDN	?	interaction variables between years and HIGHDEN
STRATH	+	dummy variables indicating location in STRATHCONA (1=yes,0=no)
DISTCBD	+	straightline distance from primary intersection in the CBD to the centre of the block containing the parcel, measured in centimeters (quarter mile units)
REZND1	?	dummy variable indicating a rezoning allowing change in use on the block or adjacent blocks in year of sale or in the previous two years (1=yes,0=no)
REZND2	?	dummy variable indicating a rezoning allowing increase in density with no change in use in year of sale or in the previous two years (1=yes,o=no)
NIPAR	+	dummy variable for location in a NIP designated area in the 1977 to 1981 periods
D71NPA TO D82NPA	?	interaction variables between years and NIPAR

TABLE III CONTINUED

NIPAD	?	dummy variable for presence of NIP area on adjacent block (1=yes,o=no)
D71NPD TO D82NPD	?	interaction variables between years and NIPAD

NEIGHBOURHOOD IMPROVEMENT VARIABLES

TREEBLK	?	dummy variable indicating introduction of trees on block face this year or in the previous two years (1=yes,0=no)
D71TRB TO D82TRB	?	interaction variables between years and TREEBLK
TREEBLK$	?	dollar amount spent for trees on block face
D71TB$ TO D82TB$	?	interaction variables between years and TREEBLK$
TREEOPP	?	dummy variable indicating the introduction of trees oposite of block face this year or in the previous two years (1=yes,0=no)
D71TRO TO D82TRO	?	interaction variables between years and TREEOPP
TREEOPP$	?	dollar amount spent for trees opposite of block face
D71TRO$ TO D82TRO$	?	interaction variables between years and TREEOPP$
SWLKBLK	+	dummy variable indicating presence of sidewalk on block face this year or in the previous two years (1=yes,0=no)
D71SWB TO D82SWB	?	interaction variables between years and SDWKFACE

TABLE III CONTINUED

SDWKBLK$	+	dollar amount spent for sidewalk on block face.
D71SB$ TO D82SB$	?	interaction variables between years and $SDWKFACE
SDWKOPP	?	dummy variable indicating presence of sidewalk opposite of block face this year or in the previous two years (1=yes,0=no)
D71SWO TO D82SWO	?	interaction variable between years and SDWKOPP
PAVELANE	+	dummy variable indicating presence of paved lane on block this year or in the previous two years (1=yes,0=no)
D71PAV TO D82PAV	?	interaction variables between years and PAVELANE
PAVELAN$	+	dollar amount spent for pavelane on block
D71PL$ TO D82PL$	?	interaction variables between years and $PAVELANE
PAVEMENT	+	dummy variable indicating presence of pavement on block this year or in the previous two years (1=yes,0=no)
D71PVM TO D82PVM	?	interaction variables between years and PAVEMENT
PAVEMEN$	+	dollar amount spent for pavement on block (1=yes,0=no)
D71PV$ TO D82PV$	?	interaction variables between years and $PAVEMENT

TABLE III CONTINUED

CURBBLK	+	dummy variable indicating presence of curbs on block face this year or in the previous two years (1=yes,0=no)
D71CBK TO D82CBK	?	interaction variables between years and CURBBLK
CURBBLK$	+	dollar amount spent for curbs on block face
D71CB$ TO D82CB$	?	interaction variables between years and CURBBLK$
CURBOPP	?	dummy variable indicating presence of curbs opposite of block face this year or in the previous two years (1=yes,0=no)
D71CB0 TO D82CB0	?	interaction variables between years and CURBOPP
CURBOPP$	?	dummy variable indicating presence of curbs opposite of block face this year or in the previous two years (1=yes,0=no)
D71CBO TO D82CBO	?	interaction variables between years and $CURBOPP
STLTG	+	dummy variable indicating presence of street lighting on block this year or in the previous two years (1=yes,0=no)
D71STLTG TO D82STLTG	?	interaction variables between years and STLTG
STLIT$	+	Dollar amount spent on street lighting this year or in the previous two years
D71ST$ TO D82ST$	?	interaction variables between years and STLIT$

TABLE III CONTINUED

RSOCFACE	+	dummy variable indicating improvement on block face this year or in the previous two years (1=yes,0=no)
DOLRSOCF	?	<$20,000=minor,>20,000=major dollars spent on recreational and social improvements on block
D71RSC TO D82RSC	?	interaction variables between years and RSOCFACE
RSOCADJ	?	dummy variable indicating improvement on adjacent block this year or in the previous two years (1=yes,0=no)
D71RSA TO D82RSA	?	interaction variables between years and RSOCADJ
DOLRSOCA	+	<$20,000=minor,>$20,000=major amount spent on recreational and social improvements on adjacent blocks
D71RA$ TO D82RA$	?	interaction variables between years and DOLRSOCA

4.5 The Methodology

An appropriate method to address the research questions posed in this thesis comes from our review of the empirical literature: multiple regression analysis employing a hybrid model consisting of physical characteristics of the house in question, zoning and neighbourhood characteristics, as well as government externalities or impact variables. It is desirable as well to include socio-economic variables, but this is beyond our present scope.

In order to study the effects of the externality variables, we will adjust for differences in characteristics among housing units. Thus, a complete specification of the physical and environmental characteristics of the housing unit will allow allow us to assess the impact of the housing improvement efforts.

This study seeks to identify the effects of NIP improvements. Thus, a search was made for a methodology that would allow for the statistical comparison of individual impact variables from year to year. For example, did the mere announcement of NIP have an impact? Did the early years of the program yield any benefits? Did the later program years show larger benefits?

The basic model utilized takes the form:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \ldots bnXn + e$$

where:

Y = dependent variable (actual sales price)

a = constant

β = coefficient of independent variables

X = independent variables (characteristic descriptors and improvement variables)

e = error term.

The methodology chosen estimates a general multiple regression equation by specifying a series of dummy variables, as well as a set of interaction terms consisting of independent variables multiplied by the dummy variables for each year. The next step, using a basic analysis of covariance technique, is to test statistically the varying effects between years by comparing interaction terms.

The method used allows both the slope and the intercept of the regression line to vary.

The equation was modelled with the principle of parsimony in mind. The choice of variables to be included in the model was kept as simple as possible in order to improve understandability and explanatory power. In addition, since the ultimate goal of this analysis is to test the significance of improvement variables, the model was not designed to be an ideal house price prediction equation.

Conceptually, the analysis of covariance technique will allow for statistical tests of whether an individual variable has changed significantly from one year to another. In order to illustrate this concept, Kmenta (1971) provides a succinct explanation through two models: The first model is the most

general and deals with the the dilemma that some models have regressors which are binary while others are not. Kmenta (1971) uses a traditional example where a consumption function is estimated from time-series data that includes a major war period:

The mean consumption is presumed to depend on whether the period is one of peace or one of war. A simple way of representing this model is

(1) $C_t = \beta_1 + \beta_2 Y + \gamma Z_t + \epsilon_t$.

where

C_t represents consumption, Y represents income, and Z is a binary variable such that

$Z_t = 1$ if t is a wartime period

$Z_t = 0$ otherwise.

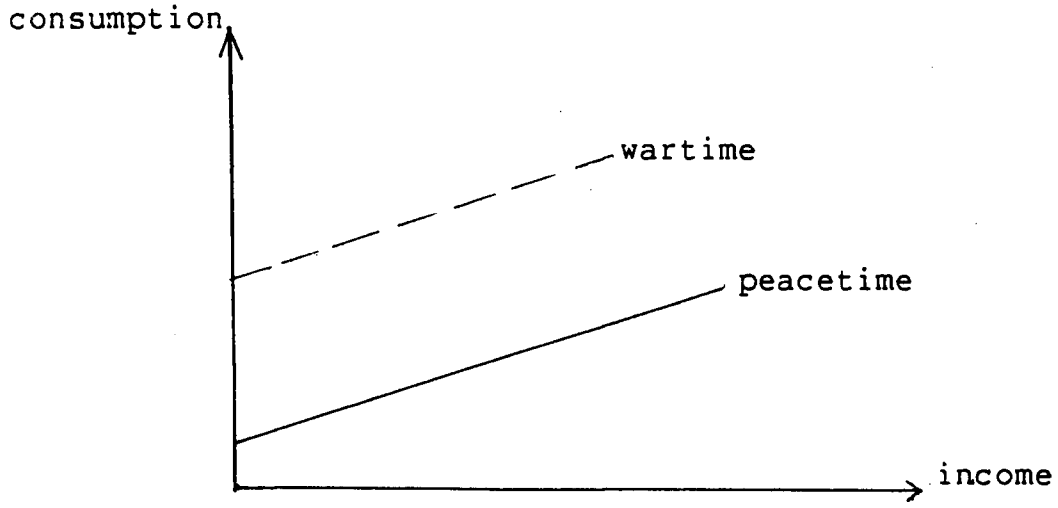
Then, we have

$C = (\beta_1 + \gamma) + \beta_2 Y + \epsilon_t$(wartime),

$C = \beta_1 + \beta_2 Y + \epsilon_T$(peacetime) (Kmenta, p.420)

It is postulated that in wartime, the intercept of the consumption function changes from β_1 to $\beta_1 + \gamma$.

Shown diagramatically on the following page:



One can then test the hypothesis that the "subsistence level" of consumption changes during the war by testing:

$H_1 : \gamma = 0$

$Ha : \gamma \neq 0$

This model formulation is the analysis of covariance technique.

Another way to formulate the problem would be to allow the slope and intercept to vary by specifying the regression model as:

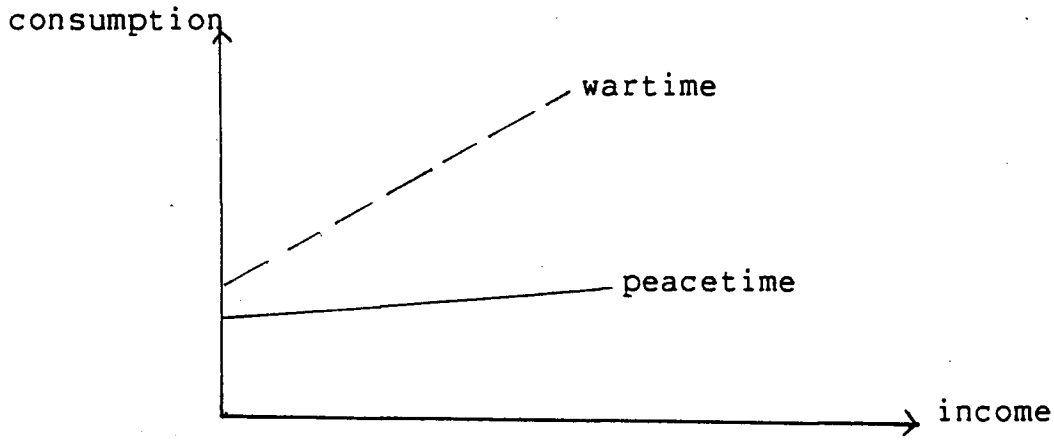
$$C_t = \beta_1 + \beta_2 Y + \gamma Z + \delta Y Z_t + \epsilon_t .$$

Then, we would have

$$C_t = (\beta_1 + \gamma) + (\beta_2 + \delta)Y + \epsilon_t \text{(wartime)} .$$

$$C_t = \beta_1 + \beta_2 Y + \epsilon_t \text{(peacetime)} \text{ (Kmenta, p.424).}$$

This model is pictured diagramatically on the following page:



The only difference between estimating two separate cross section equations for wartime and peacetime is σ^2. The regression coefficients of the least square estimators will be exactly the same.

The second model would be preferred since it will allow the effects of the improvement variables to change from year to year. Thus, the second and third research questions regarding the impacts of NIP designation and the spillover to adjacent areas will be answered by testing statistically the the impacts of the interaction terms for NIP and NIPADJ. In other words, whether NIP or NIPADJ affects property values in any given year will be evaluated, along with the question of whether the coefficients of these variables change significantly over the study years. The fourth research question of whether the impact of specific improvements change from year to year will be evaluated in the same way. A series of statistical tests will determine if variables such as sidewalks and pavements significantly affect property values in any given year, and further, whether the study years in question differ significantly from one another.

V. RESULTS

5.1 Introduction

This chapter provides empirical evidence about the externalities created by local government intervention in neighbourhoods. The Canadian Neighbourhood Improvement Program is evaluated over its entire span: pre- and post-Nip years are included to compare the effects of instituting improvements which are not part of a whole revitalization effort. Two separate specifications of the model are run using improvements coded in dollars or as 0,1 dummy variables. The results of the analysis of covariance technique are presented and the coefficients of the impact variables are tested for changes between the years.

5.2 Analysis Of Covariance Results

The statistical testing of whether the effect of the impact variables changed over the period of the study (pre-, during and post-NIP) is achieved in the following manner. Data is pooled into one model utilizing all of the years from 1971 to 1982. The first model uses dummy variables for each year as well as interaction terms for the impact variables. The interaction terms are created by multiplying the dummy variable for each year by the independent variables such as TREEFACE, CURBS, PAVEMENT (all in dummy terms). For the second model, interaction terms are created by multiplying yearly dummy variables by TREEFACE$, CURB$, PAVEMEN$ (all in dollar terms).

These interaction terms allow the effect of any impact

variable to vary from year to year.

As a first step to the analysis, a general model was formulated using CONPRICE (redefined as A) as the dependent variable. CONPRICE is the standardized selling price of each dwelling unit in constant 1981 dollars. The Vancouver CPI was used to standardize selling prices by taking ln{Price/CPI}. A base year of 1980 was chosen, and thus, the dummy variable for this year was omitted from the equations.

5.3 Dummy Variable Model Formulation

The first model estimated used only dummies for the interaction terms and had 205 variables. Table IV outlines the variables in the first equation.

The sample size was 5360 which is sufficiently large to offset any potential problems created by the large number of variables. The model had an adjusted R^2 of .31216 and an F-statistic of 17.54 making the equation significant at a level higher than .01.

This model was considered to be the most general, but with 205 variables, it was too large to analyze. Numerous iterations allowed us to delete variables to make the model more manageable. Deleteion was based on either t-statistics, which indicated lack of significance or on high correlations with other independent variables.

The variable STRATH (a dummy variable for location in Strathcona) had a high correleation with DISTCBD and so STRATH was omitted and DISTCBD became the proxy. It was also found that HIGHDEN was measuring STRATH to a certain extent. The

decision to remove Strathcona as a variable came after an F-test determined that STRATH alone was not significantly adding to the model. Next, CURBBLK, and STRLTG, along with their interaction terms,were omitted because they were consistently found to be insignificant. LOTSIZE was omitted because it was determined that GRDFL was measuring the same thing. ROOMS was omitted because it was highly correlated with PLUMBS.

In order to ensure that the omitted variables were not significantly adding to the model, the following hypothesis was performed:

H_o : all deleted $\beta = 0$

H_a : all deleted $\beta \neq 0$

An F-test indicated it was impossible to reject the null hypothesis that the coefficients of the deleted variables were equal to zero.

In addition to the systematic deletion of variables, an effort was made to combine certain variables. In an attempt to make the effects of improvements more visible, variables such as curbs, pavement, and pavement and curbs were combined, the rationale being that if single improvements are not significant, then improving more than one element on a block at a time is more likely to have an impact. Unfortunately, there were not enough cases where a combination of improvements occurred on one block to make this approach usable.

Table IV - VARIABLES IN THE FIRST DUMMY VARIABLE EQUATION

MONTH	DV71 - DV82
GRDFL	NONRES*
AGE	LOTSIZE*
BSMNT	TREEBLK*
PLUMBS	TREEOPP*
STRATH*	SDWKBLK*
DISTCBD*	SWLKOPP*
SCHOOL*	ROOMS
PARK *	LOTS
NIPAR*	GARAGE
NIPAD*	HTGTYPE
PAVELANE*	HIGHDEN
CURBBLK*	REZND1
CURBOPP*	REZND2
PAVEMENT*	STLIT*
PVMTCRBS*	RSOCFACE*
	RSOCADJ*

*Interaction terms with Years 71 - 82 included.

The following variables were all zeros:

D74SWB-D78SWB	D77CBK	D77RSC-D79RSC
D81SWB-D82SWB	D82PVM	D77RSA-D79RSA
D71PAV-D73PAV	D77STL	

5.4 Presentation Of Results

The presentation of the final results requires some clarification. There are two basic questions that can be asked of the analysis of covariance technique. The first question asks whether a variable in any given year has a significant impact on price. The second question asks whether a variable in any given year significantly differs from another year. Since the base year is 1980, the linear term of the impact variables (i.e.NIPAR, NIPAD, PAVELEANE, PAVEMENT,etc.) may be interpreted as the base year impact. Thus, if a linear term such as NIPAR has a significant t-value, the interpretation will be that NIPAR has a significant impact on the natural logarithm of deflated house price in 1980. However, if any of the interaction terms (e.g.D82NPA) has a significant sign, then one can only say that being in a NIP area in 1982 was significantly more positive or negative than being located in a NIP area in 1980. It requires further analysis to determine whether D82NPA actually has a significant impact on price.

The results will be presented in the following form. First, the final equation will be described and the significant terms (according to t-tests) delineated. The next step will be to evaluate whether there are any significant differences between years for the interaction terms in question. The third step will be to evaluate which interaction terms, if any, positively or negatively affect price.

Tables VI through XIII show the results of the statistical tests for the dummy variable coefficients. Tables XVII through

XXIV show the results of the statistical tests for the dollar variable coefficients. The tables indicate whether any of the years significantly impacted house price, and if the coefficients of the interaction terms differ significantly. Below are the two equations used to determine the appropriate t-values. First, to determine the impact on house price, one adds the coefficient of the linear term (e.g.NIPAR) to the coefficient of the interaction term (e.g.D77NPA). This result is divided by the common standard error for both coefficients combined. The t value is then evaluated for its significance at the .10 level for a two tailed test.

$$\text{T value} = \frac{\text{NIPAR(COEF)} + \text{D77NPA-D82NPA(COEF)}}{\text{STD ERROR (COMMON)*}}$$

*Calculated by: VAR(COEF,YR1) + VAR(COEF,YR2) + 2COV(COEFYR1,YR2)

The second equation is used to determine whether there is a significant difference between two years (e.g. the difference between D77NPA and D79NPA). The coefficient of a past year is subtracted from the coefficient of the most recent year, and the result divided by the common standard error. The t value is then evaluated for its significance at the .10 level for a two tailed test.

$$\text{T value} = \frac{\text{COEF RECENT YR - COEF PAST YR}}{\text{STANDARD ERROR (COMMON) *}}$$

*Calculated by:VAR(CoefYR1) + VAR (CoefYR2) + 2(COEFYR1,YR2)

The above equations will be utilized for all of the tables evaluating impacts on house prices and differences between

years.

4.1 Results Of Dummy Variable Analysis

There are 49 variables in the final equation listed in Table V which indicates the B value, t-value and significance level for each variable. The final equation has an adjusted R^2 of .31132. All of the signs for the physical characteristics variables were as expected. The variables BSMNT(+), MONTH (+), LOTSIZE (+), GRDFL(+), AGE(-) were all significant at a .05 level according to their t-statistics.

The zoning and neighbourhood variables left in the equation were :

(1) SCHOOL which had a negative and significant sign indicating that the presence of a school on the block or block face had a negative impact on house price;

(2) D82NRS which had a positive significant effect indicating that location in a nonresidential block in 1982 was significantly more positive than in 1980;

(3) D82PRK which had a positive significant effect indicating location of a park on the block or block face in 1982 was significantly more positive than in 1980;

(4) DISTCBD which had a positive and significant sign as expected, presumably due to the negative externalities present near the downtown core.

The coefficients of the improvement interaction terms indicate whether a particular term is significantly positive or negative compared to the base year 1980. The following list

indicates the relevant signs for those interaction terms found to be significant:

(1) D79SWB (-)

(2) D76PVM (-)

(3) D81RSC (+)

(4) D82TRB (+)

(5) D82RSC (+)

(6) D82NPA (-)

The common element of these significant variables is that, except for NPA, where the interaction term is pre-1980, the sign is negative, while post-1980 terms have positive signs. A possible explanation is that specific improvements such as sidewalks, pavements, and trees have accumulated over the NIP years and that their impact is, if not beneficial, at least more noticeable by 1980 to 1982. The fact that recreational and social improvements in 1982 was positive compared to 1980 may mean that there was a cumulative completion of projects by 1982, or that the improvements in place were not in operation right away. There is no easy intuitive explanation for why being in a NIP designated area in 1982 should be negative compared to 1980. Perhaps any program effects died out by 1982. Or perhaps it can be attributed to 1980 being a boom year for house prices in general (while 1982 was a bust year) so that house prices declined all over the city. If there was a general decline in prices, then it is likely that the decline would be greater in NIP and other marginal neighbourhoods.

5.5 Summary Of Important Dummy Variable Results

In this section, the tests of NIPAR, NIPADJ and RSOCFACE, RSOCADJ along with their interaction terms will be reviewed since these variables are important in answering the questions posed in this thesis. We are interested in the impacts of recreational and social improvements since the literature has stressed the importance of such amenities.

The following is a summary of the NIPAR and NIPADJ results which are portrayed in TABLES VI through IX.

1. None of the NIPAR years significantly affect house price.
2. The only significant difference between years on the NIPAR variable is that D82NPA is significantly negative compared to the base year 1980.
3. The only NIPADJ year to significantly affect house price is 1980 (a negative impact).
4. There are no significant differences between years on the NIPADJ variables.

The following is a summary of the RSC and RSA results (recreational and social improvements on the block and block face, recreational and social improvements on adjacent blocks) which are portrayed in TABLES X through XIII.

1. Recreational and social improvements on adjacent blocks do not significantly affect house price.
2. There are no significant differences between years for the RSA variables.

3. D80RSC has a negative and significant impact on house price indicating that location of a recreational or social improvement on adjacent blocks negatively affects price. None of the other years had a significant impact on price.
4. D81RSC and D82RSC are positive and significant compared to 1980. Since D80RSC has a negative impact on house price, this result simply indicates that 1981 and 1982 are not as negative. In fact, neither of these two years significantly affect house price. There is no significant difference between 1981 and 1982.

Table V - FINAL EQUATION--DUMMY VARUABLES

DEPENDENT VARIABLE = A

---------- VARIABLES IN THE EQUATION ----------

VARIABLE	B	T	SIG T
D82RSA	.07060	1.155	.2483
D79SWB	-.60951	-1.682	.0926
D82NRS	.93053	7.118	.0000
D77NPD	.14505	1.192	.2332
D78NPD	.12432	1.058	.2900
D76PVM	-.16225	-1.637	.1017
D82NPD	.14269	1.307	.1912
D79NPD	.13433	1.249	.2116
D81NPD	.14979	1.462	.1437
D81RSC	.33884	2.670	.0076
BSMNT	.06277	4.796	.0000
D77NPA	-.02640	-0.499	.6181
MONTH	.00356	2.457	.0140
SCHOOL	-.02773	-1.892	.0585
PVMTCRBS	-.04063	-1.986	.0471
DV71	-.48289	-15.239	.0000
LOTSIZE	.00001	3.720	.0002
D78NPA	-.02146	-0.428	.6688
PAVELANE	.02354	1.051	.2935
STLIT	.08291	1.609	.1076
PARK	.01635	1.220	.2224
DV75	.01422	0.486	.6269
D82TRB	.21109	1.588	.1125
DV72	-.41602	-13.939	.0000
GRDFL	.00018	10.107	.0000
D79NPA	.03084	0.709	.4786
AGE	.00369	-14.504	.0000
DV74	.06601	2.243	.0249
D82RSC	.43058	3.014	.0026
DV73	-.20182	-6.992	.0000
SWKBLK	.00005	0.001	.9996
NONRES	-.04942	-1.265	.2060
DV76	.00829	-.287	.7741
PAVEMENT	.00241	0.060	.9521
D81RSA	.00336	0.058	.9538
D82PRK	.11440	2.444	.0145
DISTCBD	.01415	6.725	.0000
PLUMBS	.02404	9.193	.0000
D82NPA	-.08635	1.781	.0750
DV81	.14851	3.629	.0003
NIPAD	-.13744	-2.362	.0182
RSOCADJ	.02630	0.638	.5237
NIPAR	.01653	0.584	.5595

DV78	-.09742	-2.276	.0229
RSOCFACE	-.29514	-2.893	.0038
DV77	-.02868	-0.628	.5298
DV79	-.27084	-7.302	.0000
DV82	-.11145	-2.730	.0064
D81NPA	.06450	1.292	.1964
(CONSTANT)	9.89162	196.102	.0000

MULTIPLE R	.56357
R SQUARE	.31762
ADJUSTED R SQUARE	.31132
STANDARD ERROR	.34406
F =	50.43942
SIGNIF F =	.00000

Table VI - T TESTS FOR THE EFFECTS OF NIPAR INTERACTION TERMS ON HOUSE PRICES

	T VALUE	SIGNIFICANT?
D77NPA	-.018	NO
D78NPA	-.008	NO
D79NPA	.077	NO
D80NPA	.129	NO
D82NPA	-.115	NO

Table VII - T TESTS FOR DIFFERENCES BETWEEN YEARS D77NPA TO D82NPA

	T VALUE RESULTS			
	1978	1979	1981	1982
1977	-.017	-.174	-.295	.363
1978		-.125	-.154	.116
1979			-.097	.354
1981				-.064

Table VIII - T TESTS FOR THE EFFECTS OF NIPADJ INTERACTION TERMS ON HOUSE PRICE

	T	SIGNIFICANT?
D77NPD	-.045	NO
D78NPD	-.0784	NO
D79NPD	-.017	NO
D81NPD	.092	NO
D82NPD	.0298	NO

Table IX - T TESTS FOR DIFFERENCES BETWEEN YEARS D77NPD - D82NPD

	T VALUE RESULTS*			
	1978	1979	1981	1982
1977	.328	.152	-.061	.075
1978		-.141	-.36	-.995
1979			-.488	0
1981				.224

*none of the t tests are significant at a .10 level

Table X - T TESTS FOR THE EFFECTS OF RSC INTERACTION TERMS ON HOUSE PRICE

	T VALUE	SIGNIFICANT
D80RSC	-2.893	YES
D81RSC	.301	NO
D82RSC	1.106	NO

Table XI - T TESTS FOR DIFFERENCES BETWEEN YEARS D80RSC-D82RSC

	T VALUES*	
	1981	1982
1980	2.67*	3.014*
1982		-1.187

*significant at a .01 level

Table XII - T TESTS FOR THE EFFECTS OF RSA INTERACTION TERMS ON HOUSE PRICES

	T	SIGNIFICANT?
D80RSA	.638	NO
D81RSA	.087	NO
D82RSA	.301	NO

Table XIII - T TESTS FOR DIFFERENCES BETWEEN YEARS D80RSA TO D82RSA

	T VALUES*	
	1981	1982
1980	.058	1.155
1981		-.344

*none of the t tests are significant at a .10 LEVEL

5.6 Dollar Variable Model Formulation

The second model substitutes dollar variables for dummy variables. Much information was gained from the analysis of the first model so that this equation could be more narrowly specified initially. There were 171 variables and 5345 cases in the first dollar variable specification ensuring no potential problems created by a large number of variables. Table XIV lists the variables included along with their interaction terms. A number of improvement variables had lacked data and are listed in the table. The most serious omissions were a lack of data for dollars spent on the sidewalk block (SB$) which only had data for 1971-1973, 1979 and 1980; dollars spent on the curb block (CB$) which only had data for 1971-1976, and 1978; and the recreational and social improvement variables (RF$ and RA$) which had improvement data for 1980-1982 only. It is important to note that this is not missing data as such, but indicates none of the improvements in question were done in that particular year. Nevertheless, these types of omissions will limit the range of conclusions that can be drawn.

The first specification had an adjusted R^2 of .30229 and an F-statistic of 18.408 making the equation significant at a level higher than .01.

A number of iterations were performed to delete insignificant variables. The variable STRATH (a dummy variable for location in Strathcona) was found to be highly correlated with DISTCBD as in the dummy variable model (correlation coefficient of -.761) and so STRATH was omitted and DISTCBD

became the proxy. This decision was made after an F-test determined that STRATH alone was not adding significantly to the model. CURBBLK$ was consistently found to be insignificant, and its interaction terms were omitted similarly, either because of a lack of data or significance. The STLIT$ and interaction terms were omitted on the same basis. After a number of regression equation runs, the only TREEBLK$ term to show up significant was D82TB$. The linear term TREEBLK$ was preserved in order to evaluate the impact of this variable on house price. PARK was a significant term, but the only interaction term to remain was D82PRK. The rest of the linear terms for improvement variables were preserved in order to evaluate individual 1980 impacts on house price. Thus, PAVELAN$, PAVEMEN$, PVMTCRB$, and SDWKBLK$ are in the final equation. Their corresponding interaction terms were narrowed to D81PL$, D76PV$, D81PVC, and D82TB$. In order to ensure that the omitted variables were not adding to the model, the following hypothesis was performed:

H_0 : ALL DELETED $\beta = 0$

Ha : ALL DELETED $\beta \neq 0$

An F-test was used to make it impossible to reject the null hypothesis that the coefficients of the deleted variables were equal to zero.

Retained for comparison purposes were NIPAR and NIPAD along with their interaction terms as well as DOLRSOCF and DOLRSOCA along with their interaction terms (1981 and 1982 only). These are the critical variables for this study and so attempts were made to keep them in the equations.

Table XIV - VARIABLES INCLUDED IN THE FIRST EQUATION OF THE DOLLARS SPECIFICATION

MONTH	CURBBLK$*
GRDFL	PAVEMEN$*
AGE	PVMTCRB$*
BSMNT	STLIT$*
PLUMBS	TREEBLK$*
STRATH	DOLRSOCF*
DISTCBD	DOLRSOCA*
PARK*	DV71-DV82
NIPAR*	NONRES
NIPAD*	LOTSIZE
SDWKBLK$*	PAVELAN$*

*interaction terms included

interaction terms with no cases:

D74SB$-D78SB$	D77CBK	D77RF$-D79RF$
D81SB$-D82SB$	D82PV$	D77RA$-D79RF$
D71PL$-D73PL$	D77ST$	

5.7 Results Of Dollar Variable Analysis

The results of the dollars equation will be presented in the same form as the dummy equation. There are 47 variables in the final equation which are listed in Table XV. The final equation has an adjusted R^2 of .30446 and an F-statistic of 50.77. The low R^2 indicates that there are other variables which may be explaining house price. Since the major goal of this study was to evaluate specific coefficients, a low R^2 is not a concern. Tucker (1983) in estimating cross sectional equation using a comparably sized data base and one of the same neighbourhoods achieved R^2's of between .08 and .58.

All of the signs for the physical characteristics were as expected and consistent with the final dummy variable model. As expected, the neighbourhood and zoning variables also yielded the same results as the dummy variable equation . The dollar variable equation begins to differ when one evaluates the interaction terms. Significant interaction terms include the following:

1. D82TB$ (+)
2. D76PV$ (-)
3. D82PRK (+)
4. D82RA$ (+)

which means that these variables significantly differed from the comparable 1980 term. The first three interaction terms listed were significant for both the dummy and dollar equations. However, D82RA$ indicated that spending over $20,000 on recreational and social improvements on adjacent blocks in 1982

had significantly positive impacts on house prices compared to 1980. The comparable dummy variable D82RSA did not indicate that the mere provision of this type of improvement had the same effect. Thus, there is an indication that the scale of the recreational and social improvement makes a difference when evaluating price impacts. NIPAD as a linear term significantly and negatively impacted house price in both the dummy and dollar equations, meaning that in 1980, being adjacent to a NIP neighbourhood had a negative impact on price. This result suggests that in a boom year for house prices city wide, the areas adjacent to marginal neighbourhoods may be less desirable than higher priced, desirable neighbourhoods.

5.8 Summary Of Results For Important Dollar Variables

The following is a summary of the effects of being located in or near a NIP neighbourhood. The statistical tests verifying these conclusions can be found in TABLEs XVII through XX.

1. None of the NIPAR interaction terms significantly affect house prices. NIPAR as a linear term was insignificant as well.
2. None of the NIPAR interaction terms differed significantly between years.
3. The NIPAD linear term was significantly negative, while none of the interaction terms significantly affected house price.
4. None of the NIPAD terms significantly differed between years.

Since the interaction terms D77NPD to D82NPD were not significant themselves at the .10 level, an effort was made to see if the combination of years was adding to the model. To this end, the equation was run omitting the interaction terms, but leaving in the linear term for 1980. An F test was then performed to determine whether the interaction terms as a group were significantly adding to the model. The results in TABLE XVI indicate that they were not. However, if significance levels of between .15 and .25 (refer to TABLE XVI) are acceptable, then one could reduce the probability of making a type II error. This state of affairs is desirable to ensure that critical variables are not falsely omitted. For this

reason, the interaction terms D77NPD to D82NPD are included in the final equation.

The following summarizes the results of dollars spent on recreational and social improvements on the block or block face and adjacent blocks:

1. 1982 was the only RA$ variable to differ positively and significantly compared to the base year.

2. None of the RA$ years significantly affected house price.

3. 1980 was the only year the dollars spent on recreational improvements on the block or block face had a significant negative impact on house price.

4. None of the RF$ interaction terms differed significantly.

Tables XXI through XXIV provide the statistical results which support these conclusions.

5.9 Summary Of General Findings

In this chapter empirical results were presented to answer the question of whether externalities are created due to a local government intervention effort. The first research question, (do local government expenditures on neighbourhood improvements, whether NIP or otherwise, have a positive effect on single family property values?), was answered in the following way. Two analysis of covariance models were estimated, one dummy

variable and the other utilizing dollar variables. Improvement data was included by using a linear term for the improvement in question (a base year of 1980) and a series of interaction terms. The results of the coefficients for the improvement data indicate that expenditures on variables such as sidewalks, trees, pavement, etc do not singificantly affect single family house prices. However, larger scale improvements such as recreational and social variables indicate that the location of these improvements on the block or adjacent blocks negatively affect single family house prices in 1980.

The second research question,(does designation as a NIP area by itself increase single family property values?) was answered by evaluating the NIPAR variables, while the third question (do the economic benefits of government expenditures on local improvements affect adjacent neighbourhoods?) was addressed by evaluating the NIPAD terms. The results indicate that designation as a NIP area by itself did not affect prices. Nevertheless, there does appear to be some spillover effect as 1980 had a significantly negative impact on price in NIP adjacent neighbourhoods.

Table XV - FINAL EQUATION--DOLLARS VARIABLES

DEPENDENT VARIABLE = A

---------- VARIABLES IN THE EQUATION ----------

VARIABLE	B	T	SIG T
D82RA$	.13272	1.622	.1049
GRDFL	.00019	10.392	.0000
D77NPD	.14434	1.184	.2364
SDWKBLK$	.00000	-1.320	.1870
PAVEMEN$	.00000	-.342	.7326
D81PVC	.00000	-1.185	.2361
D82TB$	.03887	1.710	.0873
D81RF$	.29482	1.828	.0676
D79NPD	.14006	1.299	.1942
D82NPD	.15428	1.406	.1598
D81NPD	.13969	1.356	.1753
D78NPD	.13402	1.139	.2546
D81PL$	-.00002	-1.292	.1965
DV71	-.48330	-15.269	.0000
D77NPA	-.02648	-.499	.6178
MONTH	.00336	2.305	.0212
D78NPA	-.01925	-.384	.7011
PARK	.01246	.921	.3572
TREEBLK$	-.00063	-.281	.7784
AGE	.00364	-14.280	.0000
DV72	-.41742	-14.041	.0000
BSMNT	.06297	4.788	.0000
DV76	.00728	-.252	.8008
LOTSIZE	.00001	3.213	.0013
D79NPA	.03420	.785	.4323
DV74	.06349	2.163	.0306
DV75	.01433	.490	.6239
PVMTCRB$	.00000	-1.455	.1456
D82RF$	.24534	1.385	.1661
DISTCBD	.01303	6.608	.0000
DV73	-.20283	-7.020	.0000
D82PRK	.15521	3.352	.0008
D81NPA	.04785	.954	.3401
PAVELAN$	.00001	1.369	.1709
D76PV$	.00000	-2.070	.0385
D82NPA	-.03861	-.813	.4163
PLUMBS	.02318	8.822	.0000
D81RA$	.07597	1.124	.2613
DOLRSOCA	.02416	.512	.6086
NIPAD	-.13348	-2.300	.0215
DOLRSOCF	-.29516	-2.474	.0134
DV78	-.10216	-2.382	.0172
DV79	-.27519	-7.397	.0000
DV77	-.02993	-.653	.5136
DV82	-.12945	-3.140	.0017
DV81	.16057	3.748	.0002
NIPAR	.01960	.695	.4868

(CONSTANT)	9.91015	198.838	.0000

TABLE XV CONTINUED

MULTIPLE R	.55729
R SQUARE	.31058
ADJUSTED R SQUARE	.30446
STANDARD ERROR	.34534
F =	50.77110
SIGNIF F =	.00000

Table XVI - F TESTS FOR EVALUATING THE EFFECT OF D77NPD-D82NPD

RESULTS FOR DOLLAR VARIABLE EQUATION:

$F^* = .518$

RESULTS FOR DUMMY VARIABLE EQUATION:

$F^* = .759$

$$* F = \frac{R^2\text{complete} - R^2\text{reduced}/k-g}{1-R^2\text{complete}/\{n-(k+1)\}}$$

$d.f._1 = k-g$

$d.f._2 = \{n-(k+1)\}$

Table XVII - T TESTS FOR EVALUATING EFFECTS OF NPA INTERACTION TERMS ON HOUSE PRICE

	T	SIGNIFICANT?
1977	-.0118	NO
1978	.0005	NO
1979	.08	NO
1980	.695	NO
1981	.11	NO
1982	.26	NO

Table XVIII - T TESTS FOR DIFFERENCES BETWEEN YEARS D77NPA TO D82NPA

	T VALUES			
	D78	D79	D81	D82
D77	-.024	-.183	-.242	.039
D78		-.173	-.215	-.062
D79			.039	.211
D81				.265

Table XIX - T TESTS FOR THE EFFECTS OF NPD INTERACTION TERMS ON HOUSE PRICE

	T	SIGNIFICANT?
1977	.065	NO
1978	.005	NO
1979	.029	NO
1980	-2.300	YES
1981	.03	NO
1982	.12	NO

Table XX - T TESTS FOR DIFFERENCES BETWEEN YEARS D77NPD TO D82NPD

	T VALUES			
	D78	D79	D81	D82
D77	.163	.06	.066	-.14
D78		-.085	-.073	-.286
D79			.005	-.177
D81				-.188

Table XXI - T TESTS FOR EFFECTS OF D80RA$ TO D82RA$ ON HOUSE PRICE

	T	SIGNIFICANT?
1980	.512	NO
1981	.362	NO
1982	.315	NO

Table XXII - T TEST FOR DIFFERENCE BETWEEN D81RA$ AND D82RA$

T VALUE = .40 (INSIGNIFICANT)

Table XXIII - T TESTS FOR EFFECTS OF D80RF$ TO D82RF$ ON HOUSE PRICE

	T	SIGNIFICANT?
1980	-2.474	YES
1981	.003	NO
1982	-.525	NO

Table XXIV - T TEST FOR DIFFERENCE BETWEEN D81RF$ AND D82RF$

T VALUE = -.903 (INSIGNIFICANT)

VI. SUMMARY AND CONCLUSIONS

6.1 The Implications

The goal of this thesis has been to improve on earlier studies examining the relationship between house price and public expenditure induced externalities. One area of improvement introduced is the analysis of covariance technique employed here which allows for the statistical testing of impact variables over several years. The cross sectional hedonic price equations that are typically used do not allow one to make comparisons between years. The findings of these studies are then limited to static periods of time. Another area of improvement is that a wider range of externalities have been introduced. Rather than using a few gross measurements such as air or noise pollution or a new transit system, this study examines the neighbourhood infrastructure in fine detail. Aspects of the neighbourhood that have not been examined explicitly before are evaluated in much the same way as individual housing characteristics. A third improvement is that this study examines externalities within the context of a local government invervention. Not only can one make conclusions about improvements to neighbourhood infrastructure, but the economic impact of providing these improvements through an intervention effort can be scrutinized. In tandem with the previously described RRAP evaluation, a comprehensive look at revitalization of a single neighbourhood can be made.

Other improvements introduced in this thesis include the

use of disaggregated data, and the use of a very large number of observations. Most studies aggregate data in some way, or use only a small number of single-family observations . When the goal is to describe the behavior of the individual household, using a large number of single family observations is the most reliable approach.

The most general question asked in this thesis is whether local government expenditures on neighbourhood improvements NIP or otherwise have a positive effect on property values. In order to reach the conclusion that spending on improvements via an intervention program is more beneficial than simply supplying them on an ad hoc basis, one would expect to find that variables in the pre-NIP years were significantly negative compared to the NIP years. The analysis of results indicate that pavement and dollars spent on pavement are the only physical variables to have more of an impact in the NIP years. Thus, we cannot conclude that provision of physical improvements are any better when supplied through a government program. This finding may have been different if a cumulative impact had been accounted for in the coding of the variables. Perhaps the real benefits of NIP provided improvements came through an accumulation of changes in the infrastructure. A direct method of capturing this effect was missing because of the treatment of the data base. However, the results presented some indication that improvements made more of an impact as the program years wore on. For instance, sidewalks, pavements, and trees were all significantly more positive with increasing time. Futher work

on cumulative impacts of infrastructure improvements may expand on these findings.

Having determined that pre- and post-NIP improvement variables do not, for the most part, significantly differ, we can then ask if any of these variables significantly affect price. The findings are rather puzzling. A combination of pavement and curbs had a significantly negative effect on house price in 1980, while street lighting had a positive effect in the same year. The market appears not to be valuing NIP physical improvements in any positive and/or consistent manner.

A significant impact of NIP designation on property values is nonexistent in this study. Residing in a NIP designated area does not affect property values. However, in 1980, living next to a NIP designated area negatively affected house price. A possible explanation is that many of the improvements were in place or being constructed in 1980, causing negative spillover effects in surrounding areas.

The other empirical finding of interest was that the presence of recreational and social improvements on the block had a significantly negative impact on house price in 1980. The same improvements were found to be significantly positive in 1981 and 1982 compared to 1980. One reason may be that a recreation center or community house on the block may generate some unwanted traffic and noise. Once the uncertainty of the running of a new facility are over, the market may view them less harshly. Another explanation may be that a lot of construction was going on in 1980 and none of the programs were

actually in effect. This would account for a lessening of the negative impact by 1981 and 1982.

Spending over $20,000 in 1982 on recreational and social improvements on the block also had a significantly negative effect on house price, presumably for the same reasons stated above. The dollar value indicates that the effect of improvements over $20,000 is negative compared to improvements under $20,000.

In summary, the NIP project appears not to be significantly affecting property values. In some cases, there is a negative effect while in other cases the positive effects are short lived. Based on the findings, it is uncertain whether economic effects have been stimulated by government intervention. The implication is that the NIP program may not have increased confidence in the neighbourhood and may not create positive externalities. Thus, the rationale for government intervention in neighbourhoods may not be justified on a property value impact basis. Other than property value impacts, there is the possibility that private improvements took place as a spin-off to the NIP effort or that neighbourhood decay was reversed. If this is the case, it may still be possible to provide an economic justification for the intervention.

One of the hypotheses set forth by Tucker(1983) for failing to find any significant impacts from RRAP, was that it was actually NIP creating a neighbourhood externality effect. Tucker questioned whether it was the improvement of neighbourhood infrastructure, rather than housing rehabilitation

policies that create positive effects. The current study finds that NIP is not the answer either, and so the value of revitalization programs is still open to question.

6.2 Limitations And Sources Of Error

There are four major sources of limitations and error in this study. First, there is a lack of socio-demographic information for the neighbourhoods studied. Since such census-type data is only provided every five years, it did not fit into the methodology employed. This lack of information may provide some bias in the final results if the neighbourhoods vary on an important socio-economic dimension. For instance, if years of education or mother tongue are important determinants of value, and if these two variables differ significantly between the two neighbourhoods, the results of combining these two neighbourhoods will be different than the results of examining each neighbourhood alone. It is expected that since the two neighbourhoods in question are similar with respect to income levels and social class , that these omissions will not be too serious. However, it is important to note that different results may have been found if the two study areas had been examined separately. Since Strathcona is a Chinese community, cultural considerations may determine to a large extent how neighbourhood improvements are valued.

A second source of error occurs because of the existence of RRAP funding. Since RRAP and NIP usually occur in the same neighbourhood at approximately the same time, it would be necessary to standardize for the effects of RRAP to derive pure

NIP impacts. Unfortunately, doing this was beyond the scope of this study. Again, this source of error may bias the empirical results because it is difficult to separate the effects of NIP from the effects of RRAP. Thus, the coefficients obtained for specific variables may be due to other factors relating to NIP funding.

A third source of error lies in the incompleteness of data. Ideally, this methodology should have information for each year across all variables. A number of improvement variables had all zeros for some of the years, and thus the ability to compare the impacts of each variable for each year is impossible. This may distort the results by providing some information in a comprehensive manner, but limiting what can be said about other variables to a couple of years. This is a similar drawback found in using a cross sectional methodology.

A fourth limitation exists because ideally, a measure of the initial level of service in these neighbourhoods should have been provided. It may be the case that areas with an initially negligible level of service (i.e.virtually no parks, community centres, paved streets,trees) benefit to a much greater extent than areas with a more livable level.

6.3 Recommended Areas For Future Research

The improvements mentioned in the implications section allow for more confidence in the present results. To the extent that local housing markets differ, data bases differ, or estimating techniques differ, these results may vary between studies. If similar results are found in different markets and

for different intervention programs, it might suggest that the importance of local markets or the running of specific programs is overstated.

The results indicate that improvements to neighbourhood infrastructure do not create economic benefits for the residents in the area or those in adjacent areas. It is still open to question why positive effects have not been found if the programs were in fact responding sensitively to the needs of local residents. More investigation might be done to determine how the NIP projects were run in each neighbourhood. For instance, in the Kensington neighbourhood, a 1980 report by CMHC (The Impact of NIP in B.C, 1980) indicates that residents did not hold high regard for the program's implementation guidelines. In addition, there were complaints about the short planning horizon. Citizen participation was demographically unrepresentative of the local population. These and other problems may indicate that the real needs of these neighbourhoods were not always met.

Another area for research may be the effects of an accumulation of improvements on property values. This can be done by combining various combinations of improvements, or by coding the data such that there is an accumulation on one variable over a period of years. It may be that by the thousandth new sidewalk put in, a positive benefit to the neighbourhood would finally accrue.

Further, even though yearly dummy variables were included to take into account average changes in price due to macro

factors, these variables do not control for impacts that are neighbourhood specific. Hence, a more thorough investigation of specific housing markets can be made. During bust housing periods, for instance, lower priced housing may decrease more than higher priced housing and vice-versa.

Also of interest may be an examination of possible spin-offs created by NIP for private investment in the neighbourhood. It would be interesting to find out whether development increased as a result of NIP efforts.

The important question of whether neighbourhood decay was prevented or slowed could be studied. It is difficult to say what would have happened to these neighbourhoods had local government not intervened to improve the infrastructure. One could do a time-series study of two comparable neighbourhoods, one which receives improvements to neighbourhood infrastructure and one which does not. Crime rates, demolitions, demographic changes and property values can then be compared (holding all else constant) to assess the impacts of a revitalization effort.

In summary,the analysis presented allows us to state with some confidence that government subsidized NIP creates very few direct or indirect effects on property values. If this is the goal of a program, than this rationale is not justified and an increased tax base cannot be expected to accrue. Further research has been recommended to verify that other economic justifications for NIP did not occur. Although a property value impact could not be found for the neighbourhoods examined, this is not to say that other neighbourhood programs would have the

same results. A different treatment of the data base as suggested earlier may yield more positive results.

A final word of caution must be provided for those readers interested in the policy implications of such a study. These results may not be gerneralizable to other neighbourhoods. One dimension of the two study neighbourhoods that may be relevant is that these areas were not in a state of decline. Despite the fact that they were in need of a variety of improvements, Strathcona and Kensington are stable neighbourhoods. The rationale for intervening in these types of neighbourhoods may be based on such non-economic issues as the prevention of ghettos, safety, and maintaining a general service level throughout the city.

The initial level of service may be an important variable to consider when assessing renewal programs. Examples of very successful efforts within the City of Vancouver include the False Creek, Fairview Slopes and Champlaign Heights projects. In such cases where a major revamping of a neighbourhood are done, we may see much more dramatic economic and non-economic impacts.

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