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Abstract. This paper analyzes a specific municipal tax credit program that has been passed by the City of Winnipeg, Manitoba, Canada. The program allows 50% of the net private investment in eligible conservation work on a historic building to be designated as a credit against future municipal tax liabilities (property, business and amusement) on the structure and land on which it is situated. The credit is non-refundable and expires after 10 years. This article reviews the economic logic underlying the program from the point of view of an investor. Two approaches are considered, one where the increased expenditure increases the *quantity of service* flow, the other where it results in an increase in the *quality of service* flow. It is shown how the investor's expected tax liability effects the amount of expenditure undertaken. Specifically, the proposal introduces a nonlinear subsidy schedule which limits the total amount of the investor's tax liability that can be subsidized over the 10 year period. It is demonstrated that the program is quite general and could be used by local governments to encourage spending in other areas, for example, energy conservation or general housing renewal.

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1. Introduction

In recent years, tax credits have been used to encourage a wide range of activities by various levels of governments. For example, tax credits have been used to encourage research and development, education, energy conservation, employment, foreign investment, housing renewal and even family size. While some of these credits can be used to reduce federal tax liabilities, others can be applied against state and local taxes. In all these cases, individuals earn these tax credits only be undertaking expenditures approved by the particular government sponsor.

In this paper, we examine the economic logic underlying a specific municipal tax credit program that has been recently adopted by the City of Winnipeg to encourage the rehabilitation of historic buildings.[1] An interesting feature of the program is that the present and future municipal tax liability of the potential investor plays a key role. The feature has the effect of creating a nonlinear subsidy schedule for investors since the tax credit, which is earned at the rate of 50% of the net private investment made in eligible conservation work on a structure, can be credited against future City tax liabilities, including property taxes, on the structure and land on which it is situated.[2] With the credits being nonrefundable, the investor's property tax liability may limit the amount of credits that can be used. An additional feature of the program - that the tax credit expires after 10 years - means that the future pattern of tax liabilities may play a role.

The principal goal of this paper is to examine the investment decision given this specific tax credit; however, the larger issue of *whether* historic buildings should be preserved is not addressed. Supporters of historic building preservation claim that apart from the direct benefits of an improvement in

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[1] City of Winnipeg By-Law 7155/98, passed February 25, 1998.

[2] The term municipal tax credits covers tax credit programs which apply to all taxes at the municipal level, and not just property taxes. The City of Winnipeg's proposal applies only to the city levied portion of the property tax, the school tax portion levied by local school boards in not included. The proposal also includes a credit against the City of Winnipeg's business and amusement tax.

the housing stock, there are secondary benefits which include increased tourism, employment, energy savings and waste reduction.[3] The analysis contained here can provide some information that would be useful for such a cost-benefit analysis, in particular, estimates of the benefits of historic building rehabilitation. While the analysis is presented in the context of the historic building preservation, we believe the tax credit program contains a number of insights into how other types of property tax credit programs might be expected to work. It will be seen that the program is quite general and could be used by local governments to encourage spending in other areas, for example, energy conservation, or housing renewal.

While there are a number of papers which deal with the issue of property tax incentives and local economic development, we have been unable to find any theoretical work that addresses the incentive effects of a program of the type considered here.[4] Fisher and Rasche (1984) examine the incidence and incentive effects of *state income tax credits* or rebates for household property taxes which are based on income and subject to minimum credit. Among their conclusions is that the credit adds to the progressivity of the tax structure while favouring agricultural counties and counties with high property taxes or high property values. In looking explicitly at incentives for historic preservation, Feigenbaum and Jenkinson (1984) report that federal and state incentive programs for historic preservation had a significant effect on stimulating expenditures. They found that a ten percent increase in the federal subsidy rate, would increase annual state expenditures on preservation by sixteen percent.[5] Both these papers deal with incentive programs that differ markedly from the program examined here.

This paper is organized as follows. In section 2, we review briefly the types of incentives that

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[3] See *Heritage Support: Policy and Programs*, A Report on Proposed Municipal Initiatives to Promote Retention and the Use of Heritage Properties in the City of Winnipeg, July 29, 1992.

[4] For papers which examine the issue of local incentives and economic development, see Wassmer (1994) and Anderson (1993).

[5] Feigenbaum and Jenkinson (1984:117).

states and provincial governments have offered investors to rehabilitate historic buildings. In section 3, we provide some background for the specific municipal tax credit program being considered by the City of Winnipeg and present a simple model that allows us to analyse the program based on whether the renovations are likely to increase the *service quantity* or *service quality* of the building. It will be seen that for each of these two possibilities, two cases can be considered, one where the choice of expenditures is not constrained by the investor's tax liability and the second where it is binding. The section also discusses the fact that the tax credit is defined in nominal terms and the carry-over period of tax credits is limited to ten years. Section 4 discusses a number of issues related the tax credit proposal while Section 5 offers some conclusions.

2. Types of Assistance for Historic Building Rehabilitation

In both the United States and Canada, many levels of government have been involved in the attempt to rehabilitate historic buildings. In the United States, the federal government first authorized tax incentives for rehabilitation in the Tax Reform Act of 1976 which were reauthorised and extended in the Economic Recovery Act of 1981.[6] The latter created a three tier tax credit for rehabilitation of buildings of at least 30 years old and offered owners of historic and older buildings up to a 25 percent rehabilitation tax credit depending on the building's age and historical status. However, changes incorporated in the federal Tax Reform Act of 1986 have been credited with curtailing the attractiveness of the program to developers.[7] According to Morris (1992), these changes have prompted many state and local governments in the US to develop rehabilitation programs of their own.

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[6] The following discussion is drawn from Morris (1992). See also Robinson and Petersen (1989) who summarize both the federal, state and local tax programs as well as discuss a number of economic issues that surround their use.

[7] The changes reduced the credit for historic rehabilitation to 20 percent and introduced a yearly tax credit limit of $7,000 (previously the full credit could be used when the project was completed), The tax changes also disallowed the use of rehabilitation tax credits to many taxpayers earning more than a specified income. See Morris (1992:3) for a further discussion of this point.

In Canada, because of the relatively modest amounts available from senior levels of governments, a number of Canadian municipal governments like their US counterparts have developed their own programs for heritage building renovation. A few Canadian cities offer performance or discretionary grants, with larger cities offering significantly greater amounts.[8] However, the recent trend has been toward some type of tax relief, with full or partial tax exemptions on a time limited or open-ended basis for designated buildings being the most common. A more recent trend has been the use of property or municipal tax credits.[9]

2.1 Examples of Assistance offered in the US

As of 1996, 37 states in the US offer some kind of tax relief to owners or rehabilitators of historic properties.[10] As pointed out by Beaumont (1996), the relief comes largely in two forms, state income tax credits, and state enabling laws permitting local governments to offer property tax abatement. The most recent data indicates that eleven states have enacted state income tax credits for historic preservation and rehabilitation.[11] State enabling laws are required for local governments to offer property tax relief, since state legislatures must approve any changes to property appraisals or assessments made by local governments. The legislative bodies of local governments can also establish rehabilitation and industrial

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[8] For smaller cities the maximum amounts available range from $2,000 to $50,000 on a cost shared basis. Direct loans are less common.

[9] For example, the tax abatements may be applied against the increased tax liability as in Saskatoon, or one-time property tax exemptions up to a maximum of $150,000 over five years as in Regina.

[10] Beaumont (1996:91). For a detailed listing of state tax incentives including property tax abatements, see Beaumont (1996:114-123).

[11] State income tax credits apply to residential and commercial properties in Colorado, Maryland, Missouri, New Mexico and North Carolina. In Rhode Island, Utah and Wisconsin, they apply only to residential properties, while in Indiana only to commercial properties. In Virginia and Michigan the state income tax credits apply to properties listed on the State Register of Historic Places. For details see Law and Public Policy Department, National Trust for Historic Preservation (1999), mimeo.

development districts in which local property tax abatements can be granted to industrial firms. The tax concessions offered by local governments are in the form of property tax abatements, freezes or property tax credits.[12] The abatement programs in place - which include tax freezes - differ depending on whether residential or commercial properties are covered, the amount of the abatement granted, whether minimum investment is required, and the length of the tax abatement period.[13]

Municipal property tax credits, which we define as a program where the value of the tax credit is determined by the amount of expenditure on historic buildings, have been used by communities in Washington State, Texas and Maryland. In 1985 the State of Washington passed legislation enabling local governments to offer special property tax valuations to encourage rehabilitation of historic properties. Morris (1992:5) reports that as of October 1991, 21 communities had special valuation programs in place. The special property tax valuations involve determining the appraised value of the land and improvements before rehabilitation ($x) and the value after rehabilitation ($y), as well as the rehabilitation expenditures ($d), with the *assessed value* now equal to the difference between the value after rehabilitation and the rehabilitation expenditures ($y-$d), which is called the *Special Valuation*. The minimum amount of the expenditures is 25 percent of the value of the structure, with the value after rehabilitation being estimated by the tax assessor.[14]

Property owners in Abilene Texas, after an application for what is called a historic overlay zoning, are eligible for a two-part historic tax reduction or tax credit program . The first part is a $200

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[12] Regarding abatements, Wassmer (1994) reports that both manufacturing and commercial property tax abatements (among other instruments) were used in Michigan over the past 20. He also reports that commercial tax abatements which existed in Michigan from 1978 to 1988 were deemed to be less successful and the enabling legislation was not renewed. By 1986, local governments in 28 of the 50 states had the legislative authority to grant tax abatement to manufacturing firms; however, only 21 states offered tax abatement programs to non-industrial firms.

[13] Beaumont (1996:114-123). The programs also differ depending on whether they are available statewide or as a local option.

[14] For a further discussion of the Washington State program, see Robinson (1988-89).

dollar reduction or 20 per cent of the portion of their property tax bill per year, whichever is larger. The second part depends on the amount spend on repairs. Given the remaining tax bill, the property owner earns a 50% tax credit which can be used as long as it takes to be compensated for the expenditure on the property.[15] The state of Maryland, has allowed local governments to provide a credit against real property tax up to ten percent of maintenance and restoration costs for properties located in historically designated districts.[16]

2.2 Examples of Assistance offered in Canada

In Canada, support for historic building rehabilitation is available in various forms from federal, provincial and municipal governments.[17] Support from the federal government in Canada includes performance grants through the Heritage Grant Program[18]. Repayable loans are also available based on the amount that owners must provide to match the city's grant in the Heritage Grant Program. At the provincial level, performance or discretionary grants are available in British Columbia, Nova Scotia and Ontario.[19] The Province of Quebec compensates municipalities that exempt certain buildings (classified as historical buildings) from up to 50% of property taxes under provisions of the *Cultural Properties Act.*

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[15] Since 1986, 30 property owners have used the program, for details see Morris (1992:7).

[16] Robinson (1988-89:10).

[17] For a useful summary of many of the issues and programs that are involved in heritage building conservation, see the *Heritage Support: Policy and Programs* (1992). For more recent information on Canadian programs, see Clayton Research Associates Limited (1995).

[18] The program provides restoration assistance ranging to a maximum of $25,000, with owners eligible for 3 grants over a 15 year period, with cost sharing varying over the three applications. The cost sharing ratio is 1:1 for the first grant, with a 1:3 ratio (city:owner) for the third. Between 1978 and 1989, close to $500,000 in municipal grants had been awarded to more than 53 designated buildings and 26 structures in designated heritage districts, *(Heritage Support: Policy and Programs*, (1992:79)).

[19] The programs are for British Columbia, grants are available up to a maximum of $250,000; for Nova Scotia (up to 30% of the cost to a maximum of $5,000 for exterior or structural work on a designated building) and for Ontario (assistance up to 50% of eligible costs with no ceiling involving a minimum expenditure of $10,000).

Regarding tax credit programs, the cities of Edmonton, Regina and Montreal, (the last joint with the Province of Quebec), have municipal tax credit programs in place. The Edmonton plan has three levels of tax rebate up to a maximum of seven years per municipally designated building. The first is equal to the "building only" portion of the property taxes for up to five years, the second is a two year rebate or cancellation of taxes on both land and building while construction is occurring, and the third is a five year annual rebate on any increase in property taxes the base calculated in the year prior to construction.[20] The program in Regina allows for tax exemptions equivalent to a maximum of 50 percent of the cost of restoration (to a limit of $150,000) or five years' taxes, whichever is less.[21] The plan for the City of Montreal, applies to owners of commercial heritage buildings who undertake eligible conservation work can qualify for a credit on their provincial real estate tax. The project must cost at least 10% of the building's municipal assessment up to a maximum of $4 million. As of 1995, the Province of Ontario has a property tax rebate policy for heritage properties in the planning stage, while the cities of Calgary, Vancouver, and St. John have also been deliberating over their own tax based programs.[22] The City of Winnipeg has approved a municipal tax credit program, which is examined in the following sections.

3. The Municipal Tax Credit Program for the City of Winnipeg

3.1 Background

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[20] For projects that do not result in a substantial increase in realty taxes after renovation, the city may pay the costs of rehabilitating certain architecturally or historically significant portions of the building,
(*Heritage Support: Policy and Programs* (1992:85).

[21] If an owner spent $500,000, and property taxes were $40,000, then the tax relief would equal $150,000. If the property taxes were only $20,000, then the tax relief would equal ($100,000) - five years taxes at $20,000 per year, Clayton and Associates (1995:6).

[22] Clayton and Associates (1995:5).

It is useful to provide a short history of the City of Winnipeg in order to provide some context for the municipal tax credit program that was adopted. Incorporated in 1874, the City of Winnipeg, Manitoba, developed out of a collection of fur trading posts and forts and settlers' cabins near the forks of the Red and Assiniboine Rivers. Winnipeg served as "The Gateway to the West" in Canada during the major immigration booms of the 1890s and the first decade of the 1900s and developed major entrepot functions. At the time, prior to the building of the Panama Canal, Winnipeg was seen as a major component of the transcontinental rail bridge from the Pacific to the Atlantic. These circumstances led to a development boom which in turn led to the construction of a large number of "modern" warehouses, industrial and office buildings during the late 1800s and early 1900s which were designed by prominent architects to advanced standards for the day.[23] The end of the prairie settlement policy and the opening of the Panama canal ended the development boom, which reduced development pressures in Winnipeg leaving a large stock of heritage buildings. Collectively, they are considered as one of the largest and finest collections of turn-of the-century buildings in North America and have been designated a "world heritage site".

To assist in their preservation, the City of Winnipeg adopted in principle a series of recommendations designed to conserve and utilize the heritage buildings.[24] The proposal for a municipal property tax credit came forth following a lengthy review of alternative heritage conservation policies undertaken by an Ad Hoc Committee on Heritage Buildings. This committee was composed of Councillors, administrators of the City, heritage conservation advocacy groups, the architecture profession, the real estate and development sector and the construction industry.

The tax credit program that was adopted provides investors with a tax credit against his/her tax

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[23] An extended discussion of the development of downtown Winnipeg can be found in Lyon and Fenton (1984).

[24] *Heritage Support: Policy and Programs* (1992).

liabilities in the renovated heritage building, an amount that is the lesser of ½ of allowable expenditures or the investors current and future tax liability in the building. The tax credit can be realized over a ten year period, with the tax credit being defined in nominal terms. For example, if $100,000 is being spent in 1996, then the investor becomes eligible for a tax credit of $50,000 in nominal terms. That is the value of the credit is not indexed.[25] The tax liabilities that are eligible for the tax credit include, all property, amusement and business taxes. It is this broader base which allows the tax credit to be defined as a municipal tax credit rather than solely a property tax credit.[26]

3.2 The Model

The incentive properties of the municipal tax credit program can be understood with the aid of the following model. Let Q(E) be the increased service flow or service quality that arises from the expenditures on rehabilitation, defined as E.[27] The total value added in present value terms is defined as pQ(E) where p is the constant price per unit in present value terms of the service flow (or alternatively service quality) defined as $p=p_s/r$ is the p_s is the yearly service price and r is the discount rate.[28] In other words, pQ is the increased value of the building in present value terms. Since the increased value of the building will bring forth an increased property tax liability, the after tax value added is given as (1-m)pQ, where m is fraction of property value paid in taxes.[29] Thus mpQ is the present value of the additional

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[25] One complication is that the tax credit expires after 10 years. The role of the ten year horizon is discussed more fully in the context of the model.

[26] The City's first tax credit under special transitional rules has just be announced. The basic program is as outlined in this paragraph.

[27] In the following section we discuss the different interpretations in more detail.

[28] A major issue in municipal taxation is the extent of tax shifting that takes place, for recent discussions see Palmon and Smith (1998) and Man (1995). In the context addressed here, the question is to what extent is the tax credit capitalized in the value of the building. Our definition of value added can be interpreted as incorporating the value after the shifting has taken place.

[29] That is m=Total Taxes/Value of Property. For example if total taxes are $2500 and the total

property tax liability that results from the rehabilitation expenditures.

The tax credit program allows the investor a tax credit against his/her tax liabilities in the renovated building, an amount that is the lesser of C_T=fE or C_T=p[T_o+mQ] where C_T is the dollar value of the tax credit. The parameter f is the fraction of the eligible expenditures which earn a tax credit, which is currently set at ½, while T_o is the investors current tax liability and T_1=mpQ is the increased tax liability brought about by the renovation expenditure increasing the value of the building.[30] The present value of the tax liabilities is then given as p[T_o+mQ(E)], where the 10 year horizon is incorporated in the parameter p.

Given the program, the profit for the investor is given than as

$$\pi = (1\text{-}m)pQ - E + C_T$$

where the value of the tax credit that is described by the two constraints,

$$C_T \leq fE \qquad \text{(i)}$$

$$C_T \leq p[T_o + mQ(E)] \qquad \text{(ii)}$$

The constrained optimization problem corresponding to the above is

$$\mathcal{L} = (1\text{-}m)pQ - E + C_T + \lambda_1(fE\text{-}C_T) + \lambda_2[p(T_o + mQ(E)) - C_T]$$

The Kuhn-Tucker conditions for this problem are

$$\partial\mathcal{L}/\partial E = (1\text{-}m)p\,\partial Q/\partial E - 1 + \lambda_1 f + \lambda_2 pm\,\partial Q/\partial E \leq 0, \text{ if } <0, E=0 \qquad (1)$$

$$\partial\mathcal{L}/\partial C_T = 1 - \lambda_1 - \lambda_2 \leq 0, \text{ if } <0, C_T=0 \qquad (2)$$

$$\partial\mathcal{L}/\partial\lambda_1 = fE\text{-}C_T \geq 0, \text{ if } >0, \lambda_1 = 0 \qquad (3)$$

$$\partial\mathcal{L}/\partial\lambda_2 = p(T_o + mQ(E)) - C_T \geq 0, \text{ if } >0, \lambda_2 = 0 \qquad (4)$$

Condition (1) indicates that no expenditures will occur if the after tax marginal value added (the first

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value of the property is $100,000, then m=.025. This differs from the mill rate which is the taxes paid per $1,000 of assessed value.

[30] It should be noted that the tax credit is transferable since the new owner formally assumes any obligations associated with participation in the program.

term) plus the benefits from the tax credit proposal (terms three and four), is less that the marginal cost of the expenditure, which is equal to -1. Conditions (2) through (4) capture the effects of the tax credit program. There are two principal cases to examine, the first where $C_T = fE$, that is $\lambda_1 > 0$ and the second where $C_T = p(T_o + mQ(E))$ or $\lambda_2 > 0$. The first is where the investor has enough tax liabilities to allow the maximum value of the tax credit to be taken, the second is where the tax liabilities constrain the total value of the credit that can be taken.

Case (i) Full Credit can be taken ($\lambda_1 > 0, \lambda_2 = 0$)

In this case $\lambda_2 = 0$, which means from (2) that $\lambda_1 = 1$, which if substituted into (1) yields the condition that $(1-m)p\,\partial Q/\partial E = (1-f)$, which means that expenditures are increased until the after tax marginal value added equals the marginal cost of expenditures, given as (1-f).

Case (ii) Tax Credit Constrained by Investor's Tax Liability ($\lambda_1 = 0, \lambda_2 > 0$)

In this case $\lambda_1 = 0$, which means from (2) that $\lambda_2 = 1$, which if substituted into (1) yields the condition that $p\,\partial Q/\partial E = 1$, which means that expenditures are increased until the marginal value added equals the full marginal cost of expenditures, 1.

3.21 The Role of Carry-Over of the Tax Credit and Nominal Values

The analysis to this point has treated the investor's decision as an exercise in choosing a single expenditure level which maximizes value added in present value terms. Given the proposal, the profit for the investor can also be written as the sum of the per period value added or $\pi = \sum \delta^t [(1-m)pQ_t - E_t + C_t]$, $t=0,..10$, where 10 is the period over which the credits can be used in the case examined here. It is possible to amend the model in section 3.2 to account for an expenditure decision in each period, subject to the single period constraints (which are counterparts to the constraints (i) and (ii)) as well as the total constraint applying to the ten year period. We feel the approach taken here is simpler for the following

reasons. First, in most cases, we feel the expenditure on rehabiliation would take place in a single period, which means that apart from the first year expenditure, the expenditure levels over the remaining ten year period would be zero. Second, the carryover provision effectively eliminates any single period constraint, in terms of the ability of the investor to use the credit. For example for the case where all expenditures are made in the present period, the carry-over provision enables the investor to apply the credit earned against the tax liabilities that might be incurrred over the next ten years.

The carry-over provision included in the tax credit program is particularly important for investors who wish to make large expenditures in the early stages of rehabilitation of the historic building. If the rehabilitation of the building requires a large initial expenditure, then it is would less likely that the full credit C_t=fE could be realized if the credit could only be applied against taxes in any particular period. Thus, it is clear that the carry-over provision is particularly advantageous for investors with modest annual tax liabilities. These same investors are harmed somewhat; however, by the non-indexing feature of the program. The fact that the value of the credit is defined in nominal terms means that the longer the investor must wait to claim the tax credit, the lower is its present value. The non-indexing component is a disincentive for the investors which small tax liabilities, as it is likely they would be unable to obtain the same total value of the credit, in present value terms, as an investor with a larger tax liability. In summary, while these features add complications to the nature of the program, they do no alter the crucial elements of the investment decision as described in the models presented at the outset.

3.4 A Specific Formulation

It is clear that rehabilitation expenditures can affect the usefulness of a building in a number of ways. The expenditures can increase the total usable space of the building or in other words *increase the quantity of service flow.* A second way is that the expenditures can *increased quality of the service flow.* That is, more value can now be realized from the existing space. Both cases are analysed below.

(i) Increased Service Flow Interpretation

A useful specification of this approach is to assume that service flow, given by Q, is related to expenditures, E, in the following manner, $Q=aE - E^2 - Q_o$ where Q_o is a constant. This function incorporates a number of assumptions regarding the effect of rehabilitation expenditures on the quantity of the service flow. First the function exhibits diminishing returns to increased expenditures, which implies that there will be some maximum level of expenditures that would be desired.[31] Second, the constant term Q_o suggests that expenditures do not immediately increase the service flow, implying that some critical level of expenditure E, must be reached before they are beneficial.

The incentive effects posed by the specific tax credit program are depicted in Figure 1, which plots the total cost and the total value added from the expenditures on rehabilitation. The shape of the total value added reflects the functional form $TB=(1-m)p(aE-E^2-Q_o)$.[32] The total cost is represented by the line TC=E which reflects a slope equal to 1.The diagram describes a situation where the total costs are everywhere above the total benefit line which indicates that without a subsidy plan in place no expenditures on rehabilitation would take place. The tax credit proposal under consideration introduces a second total cost line $TC_s=sE=.5E$ which is drawn to reflect the subsidized expenditure, where s=1-f=½ for the proposal being considered.

[Figure 1 here]

For each level of an investor's tax liability there is a line drawn parallel to TC=E, with lower lines reflecting a larger investor tax liability. The case where the full expenditure subsidy can be taken

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[31] The quadratic function is used primarily for convenience, the function literally implies that after the maximum point, increased expenditures would *lower* the service flow, which is not likely to be the case. We use only the range of the function where it is increasing or constant.

[32] We can determine the initial level of expenditure that must be overcome before the expenditures can increase the service flow, defined as E_o, by determining the roots of the quadratic equation,
$(1-m)p(aE-E^2-Q_o)=0$. It is clear if $E_o=0$, then some rehabilitation expenditures would take be place, even without a subsidy.

occurs when the investor's total municipal tax liability is of the size T_1^o, which results in a parallel shift downwards of the TC=E line yielding the total cost line TC_1=TC- T_1^o. For this investor, the expenditure on rehabilitation is increased until the slope of the total value added line TB, equals the slope subsidized expenditure line TC_s=sE=.5E, which occurs at level E_1*. This case occurs if the investors tax liability is larger than the total subsidy that is earned at the optimal expenditure level, that is C_T=.5E_1*< T_1^o =T_o+ΔT where T_1 is the investors total tax liability. The investor still pays some municipal taxes in this case.

The second case is where T_1 is not large enough for the unconstrained optimum expenditure to be optimal. If the investor was given a complete tax abatement on all taxes, T_1^1, the investor would have a total cost curve given as the dotted line TC-T_1^1. However, the specific program is not equivalent to a tax abatement program but is the lower envelope of two curves, specifically the lesser of TC_T=.5E or TC_1 - T_1^1. The darkened line indicates this lower envelope which as drawn produces a kink in the total subsidy line. Figure 1 shows that the optimal expenditure level for this case is E_1**, which is where the slope of the total value added line TB, equals the slope of the subsidy line TC-T_1^1, which is equal to 1.

Figure 1 can also be used to characterize other types of municipal incentive programs for historic building rehabilitation. A pure grant program is designed to shift the TC=E line to the right.[33] Alternatively, a tax freeze on the increased value, which means that m=0, would shift the total benefit function upwards, once again, implying that a positive level of expenditure might now be economic.

Using the specific functional form we can solve for the optimal expenditure given the investor's tax liability. For the case where the full subsidy can be taken, expenditures are increased until the marginal benefit from expenditures, MB=(1-m)p(a-2E) equals the marginal cost given as (1-f). The marginal benefit might be thought of as the *marginal value added* that results from the expenditures. As can be seen, the benefit to investors from the tax credit proposal depends on a number of factors; the

[33] Where the grant equals E_o, it can be shown that now some positive level of expenditure would be undertaken.

marginal productivity of expenditures, the market price for building space, as well as the mill rate of the municipality. Equating MB and (1-f) yields $E^*=a/2-(1-f)/2p(1-m)$. The comparative static results are all sensible, increases in the productivity of expenditure (a), the rental price (p), or the subsidy rate (f), increase the optimal level of expenditures, while an increase in the mill rate (m), the mill rate lowers the optimal level of expenditures.[34]

(ii) Increased Quality of Service Flow Interpretation

Another possible effect of expenditures on renovations is that they raise the *quality* of the service flow from an existing building. To capture this idea, suppose the demand for space in the building is now given as $p(V,B_o)=kV-B_o$, where k is a constant and V is the quality level of the building and B_o is the size of the building (in terms of square feet or metres) which is fixed . This states that the marginal willingness to pay is increasing in the quality of the building but decreasing in the size of the building. Now suppose that the quality of the building is effected by rehabilitation expenditures as follows, $V=\alpha E-E^2-V_o$ which states that the marginal effect of increased expenditures on quality is positive, but diminishing, that is $dV/dE=\alpha-2E$. The parameter V_o reflects the spending threshold that must be overcome before the expenditures increase the quality of the building. Substituting for V in the inverse demand function yields, $p(V,B_o)=k(\alpha E-E^2-V_o)-B_o$.

The total benefit after taxes is given as $TB=(1-m)[k(\alpha E-E^2-V_o)B_o-B_o^2]$. The total diagram for this case is almost identical to the increased quantity of service diagram as represented in Figure 1. The principal difference is that the total benefit function now touches the vertical axis at $-(1-m)][kV_oB_o+B_o^2]$. The total benefit function is graphed as a concave function which if we normalize the size of the building to $B_o=1$, can be rewritten as $TB=(1-m)[k(\alpha E-E^2-V_o)-1]$. The total cost functions and the total subsidized cost function remain unchanged as TC=E and TC=.5E. The total cost net of the investor's tax liability,

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[34] The derivatives are $\partial E^*/\partial a=1/2>0$; $\partial E^*/\partial p=(1-f)/4p^2>0$; $\partial E^*/\partial f=1/[2p(1-m)^2]>0$; and $\partial E^*/\partial m=-(1-f)^2/[2p(1-m)^2]<0$ which hold given $(1-f)>0$.

$TC\text{-}T_1$ also remains unchanged. The incentive system operates in the similar manner here, with the total tax liability of the investor again determining the total subsidy and the level of expenditures. The subsidy scheme results in a kinked expenditure curve as in Figure 1.

This interpretation can also be depicted using a per unit diagram. The marginal benefit from increased expenditure on building quality is given as $Mb_q=(1-m)k(\alpha-2E)B_0$ which in this case is equated to the marginal cost (1-f). This marginal decision is illustrated in Figure 2.

[Figure 2 here]

Inspection of the diagram reveals that a larger building, that is a larger B_0 results in a higher marginal benefit curve but as well as a steeper slope. The steeper slope implies that the larger is the size of the building the more rapid is the fall in the marginal benefits of increased quality from an increase in expenditures. The optimal level of expenditure is given by equating MBq =MC and solving which yields for $E^*=\alpha/2 - (1-f)/[(1-m)2kB_0]$. It is straightforward to show that the equilibrium level of expenditure is decreasing in the mill rate (m), but increasing in the marginal productivity of the expenditures (α), the subsidy rate (f) and the size of the building (B_0).[35]

(iii) Incorporating External Benefits from Rehabilitation Expenditures

It is also possible to incorporate the benefits that accrue to one building owner when other building owners rehabilitate their buildings. A simple modification to the quadratic formulation for the increased service flow approach would be $Q_i=a(E_i + d\sum E_j)- (E_i + d\sum E_j)^2 - Q_o$, where Q_i is the increased service flow from building *i* with *j=1,n* being the other buildings in the area. The parameter d measures

[35] The derivatives are $\partial E^*/\partial m= -(1-f)^2/[2kB_o(1-m)^2]<0$; $\partial E^*/\partial \alpha=1/2>0$; $\partial E^*/\partial f=1/[2kB_o(1-m)^2]>0$; $\partial E^*/\partial B_o=(1-f)/[(1-m)2kB_o^2]>0$ which hold given $(1-f)>0$. The last derivative confirms the outcome depicted in Figure 3, that the intersection of $MB(B_1)$ and MC_s is to the right of the intersection of $MB(B_o)$ and MC_s, where $B_1>B_o$.

the degree of the external benefits, with presumably $0<d<1$.[36] The marginal benefit from expenditures on building *i* is then $Mbq_i=a - 2(E_i + d\sum E_j)$. This implies that for a given marginal cost of expenditures, that the greater is the expenditures on other buildings, the lower is the amount of expenditures required by building owner *i*. Using Figure 1, this would imply that the entire value added curve is shifted upwards, as expenditures by other building owners is increased. It is clear that expenditures by other building owners could affect the marginal benefits from expenditures in other ways, for example shifting the entire marginal benefit schedule in a parallel fashion.[37] In Figure 1 this would shift the entire value added schedule to the right as well as altering its shape.

4. Additional Issues Regarding the Tax Credit Proposal

4.1 The Role of Tax Credits for Amusement Tax and Business Tax

The program adopted by the City of Winnipeg allows the investor to use the tax credits not only against his/her property liability but also against the amusement taxes and business taxes levied by the city on the revenues earned by the business operating in the building. If the investor is an owner operator then its level of business tax would be a component of its future tax liability, and furthermore, if it was producing a service which qualifies for an amusement tax then it would also have this potential tax liability to apply the credits against.

In the case that the owner is renting out the building to a tenant, then the tenant is entitled to receive the tax credit against business and amusement taxes if it operates out of the historic building. Depending on the respective substitution possibilities of the tenant, then some of this tax credit could be

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[36] If d=1, expenditures by building owner *j* are perfect substitutes for expenditures by building owner *i* on increasing the service flow on building *i*.

[37] For example the function could be $Q_i=a(E_i \sum E_j)- (E_i)^2 - Q_o$, which would imply that the marginal benefit is then $Mbq_i=a(\sum E_j) - 2E_i$, which implies that the entire marginal benefit curve from expenditure on building *i* is shifted to the right, the higher the level of other expenditures by neighbouring building owners.

received by the building owner, in the form of a higher rent or a greater occupancy rate. The particular amount shifted would depend on the individual building and tenant. Once again these elements are complications which do not change the conclusions of the analysis contained here.

4.2 Empirical Implications

The analysis undertaken here is in conjuction with an empirical program that is underway. Due to the novelty of the program, a systematic analysis of the effectiveness of the tax credit program is premature. However, we are in the process of compiling and ananlyzing data on heritage building values and renovation expenditures in order to get a feel for the magnitude of the parameters in the theoretical model. In the empirical work, our objective is to isolate changes that result from the expenditures on the historic buildings from changes in building values that are unrelated to the expenditures. Thus we are developing an extensive time series and cross section data set on historic buildings as well as data on buildings not declared as historic to be used as a control group. This will allow us to obtain estimates of the effects of renovation expenditures on historic buildings, which will provide some insight into the likely effectiveness of the tax credit program.

5. Conclusion

This paper has analysed a specific municipal tax credit program that has been adopted by the City of Winnipeg. The tax credit applies to an investors' total tax liability (property, business, and amusement), in order to encourage rehabilitation of heritage structures. As illustrated the program is quite general and could be used to encourage a number of types of expenditures that would be desired by a local government.

The program has a number of features which may appeal to local government officials. The first is the program is targeted to a specific activity, in the case examined here, the expenditures must be on the

heritage building. The second is the fact that the total tax liability of the investor plays a role. Investors with large tax liabilities cannot use the program to escape all their tax liabilities, since the program involves the lesser of ½ the expenditures or the investors' tax liabilities. Investors with small tax liabilities may be able to avoid paying any tax over the ten year period, but the total loss in tax revenue to the municipality is slight.

While this paper is limited to a theoretical examination of the program, as the number of investors participating in the program increases, we will be able to evaluate empirically the success of the program. In the interim, we are examining the historical record of buildings that have been rehabilitated without the tax credit program, in order to determine the relationship between expenditures on rehabilitation and the subsequent building values. This should provide some additional insight into the nature of the program.

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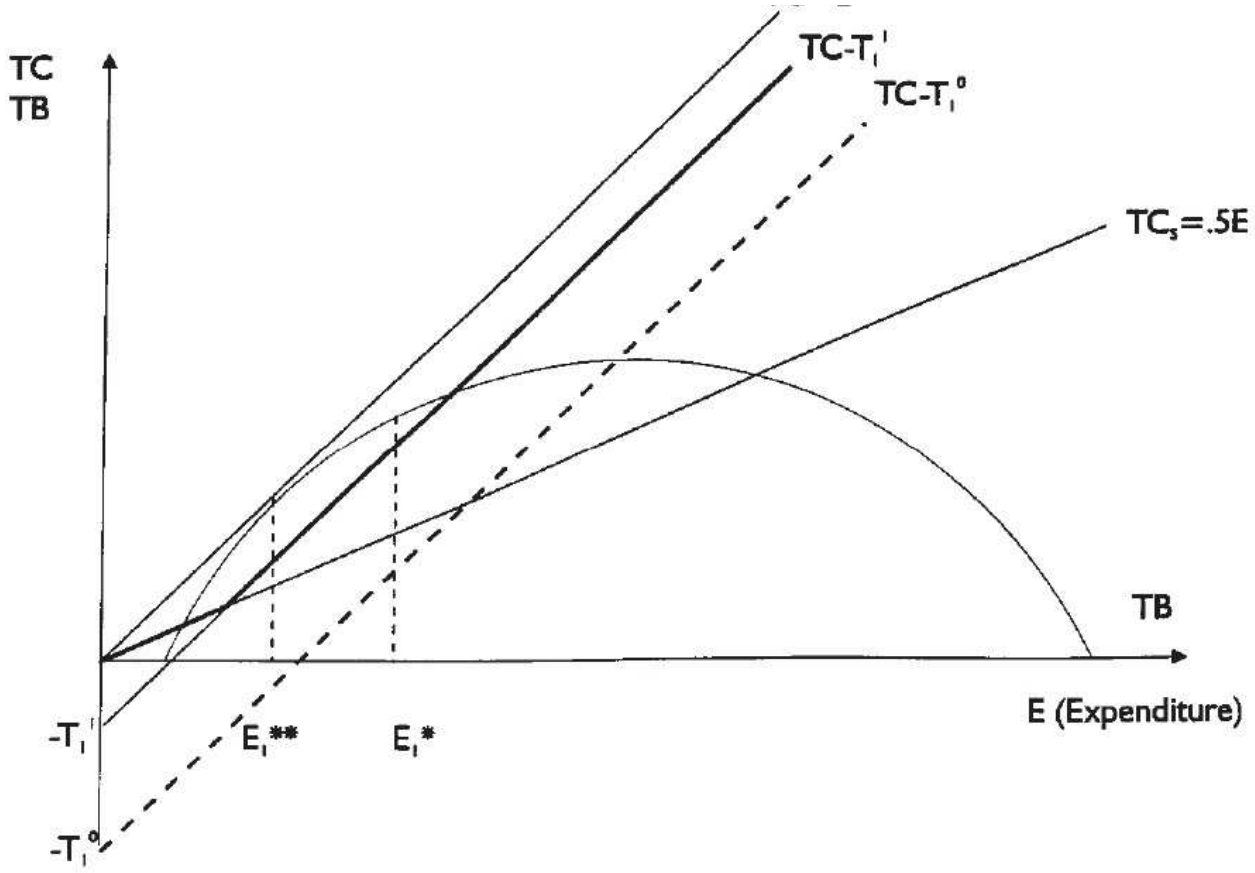
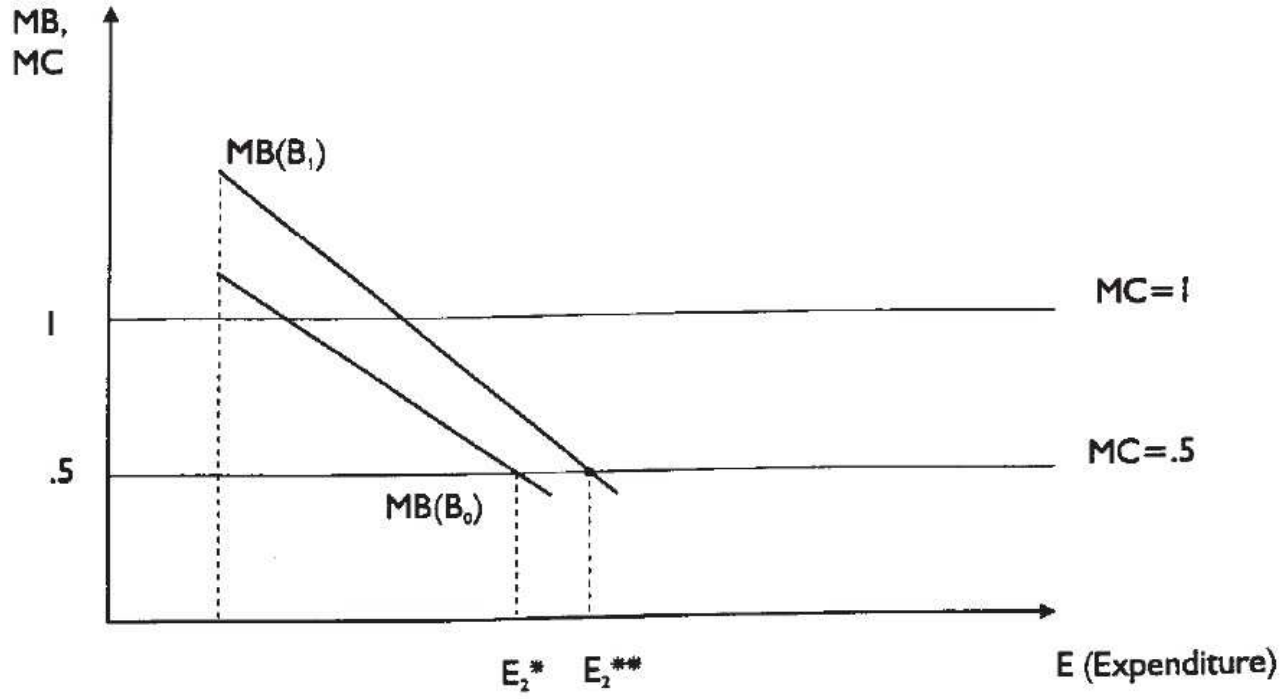


Figure 1: The Municipal Tax Credit Proposal Increased Quantity of Service Flow



(i) Unconstrained case

Figure 2: The Municipal Tax Credit Proposal (per-unit diagram) Increased Quality of Service Flow Approach