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LAND VALUE TAXATION AND FINANCING PUBLIC IN-  
FRASTRUCTURE WITH LAND VALUE CAPTURE

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# ABSTRACT

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The purpose of this thesis is to examine the effects of land value taxation and land value capture methods. Land value capture methods can be divided into three categories which are betterment tax, accessibility increment contribution and joint development.

Theory of land value taxation, discussion about neutrality and challenges with the use of land value taxation are introduced. Value capture methods and their impacts according to prior research are examined. Finally the incidence of both land value taxation in general and land value capture methods is studied. Studies from different parts of the world are introduced and patterns in terms of effectivity are identified.

By comparing models which estimate the incidence of land value taxation the conclusion can be made that introduction of a land value tax have different effects depending on which kind of factors and sectors are included in the model and if they are mobile or immobile.

The factors which influence a value capture mechanism's ability to succeed are found to be increment of accessibility, rate of overall growth in the area, availability of developable land and zoning incentives and constraints.

In the use of land value taxation and land value capture the overall characteristics of the area have a significant impact on the results and they should be considered when making policy decisions.

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# 1. INTRODUCTION

A pure form of land value tax means taxing only the unimproved value of land. A partial form on the other hand means taxing both the unimproved land and the improvements but improvements with a lower tax rate. Other differences in taxation policies include the introduction period. A land value tax can be introduced once or it can be introduced gradually during some time period. Also the rate might differ for groups of land-owners if wanted for political reasons.

The most famous advocate of land value taxation was Henry George, an American political economist who argued that the economic value derived from land should belong to every member of the society. Because the value of land depends on what is next to it (infrastructure, shopping possibilities), the value should, according to him, belong to the community which has affected the value.

Arguments on behalf of land value tax are efficiency, neutrality, difficulty of avoidance, small amount of bureaucracy and incentive to develop land. Land value taxation can also be argued to decrease the level of inequality, but there are always issues of fairness with every change in taxation policies. Because members of society have made decisions based on policies that were used in the moment of decision making, the outcome with a different policy might differ and the ethics of it must be taken into consideration.

Although the economic principles behind land value taxation seem clear, there is no consensus of its working in a modern society. The research and literature of the subject is quite wide-ranging. Most taxes are levied on flows of income and of expenditure. Land and property have also been taxed for centuries and they still contribute an important part on tax systems around the world. The most important benefit of taxing land and property is that it has only a small effect on human behaviour. The supply of land and property is quite unresponsive to its price and thus there is no significant distortion. Also the owner of land and property is easily identified so the tax is easily pointed to the right person.

Land and property are usually seen as a unit and the tax is in most countries levied both to the value of the property and to the land in which the property stands on. Those can be separated to be able to concentrate on taxing solely the value of the land.

There has been a consensus among economists about the efficiency of land value tax. The supply of land is fixed and is not affected by the introduction of a tax. Because people would not be willing to pay more, the tax would reflect as lower prices all together. The owners of the land during the time a land value tax is introduced would suffer a windfall loss in the value of the land, but the incentive to buy, use or develop land would stay unchanged. Land is also fixed in mobility unlike for example capital and labor which makes the avoidance of land value tax difficult.

According to research on both land value taxation and other forms of taxes, a switch from value added tax and income tax to a land tax would lead to higher labor productivity and per capita living standards (Dye and England, 2009). The distributive aspects of a land value tax on the other hand can be seen as its largest obstacle as the impacts of such a tax can be seen unfavourable to some and more favourable to some.

Planning regulations do cause some elasticity in the supply of land. In some countries it is specified by governments to which use the land is to be purchased. The price of land to be used in agriculture is usually significantly less expensive than business or residential use.

Land value capture is a method used to finance infrastructure projects. In this thesis, different value capture methods are examined and numerous studies regarding them are introduced. Value capture techniques are divided into three categories, the betterment tax, accessibility increment contribution and joint development. Land value capture finance has been used broadly around the world to finance transport projects and it's importance is seen as the economic, social and environmental value that transport accessibility and land development planning together create.

Areas with good transport opportunities tend to be valued higher than areas with poor opportunities. The impacts of large infrastructure projects such as building metro lines or new stations on land values near them have been reported comprehensively. Land value capture is a method used to fund public projects such as infrastructure investments.

The focus of this thesis is to offer an analysis of land value taxation and value capture

methods. First the theory and incidence of land value taxation are examined and then the focus shifts to land value capture methods used around the world.

## 2. LAND VALUE TAXATION

### 2.1 Analytics of land value taxation

#### 2.1.1 Theory of land value taxation

In this chapter the theory of land value taxation is going to be introduced. First the historical idea of land value taxation is examined, then some basic economic principles of the relationship between land value, land rents and taxes and partial and general equilibrium effects are discussed. Neutrality of land taxation and the issues with neutrality, the timing effect and the capital intensity effect are also examined.

The idea of land rents was introduced by Adam Smith already in the 18th century. But perhaps the most famous economist associated to land value taxation is Henry George, who is known for his ideas about taxing economic rent of land. He argues that it is the most logical source of public revenue because the rent coming from location value comes from communities and public investments (George and Busey, 1930). His ideas lead to the formation of an ideology called Georgism. Georgists believe that resource rents should be captured by communities.

The first argument for a land value tax Henry George established was the efficiency (George and Busey, 1930). A land value tax does not distort the behaviour of the economy as land's supply is fixed and the value depends on what tenants are willing to pay. The tax cannot be passed to tenants as Adam Smith had already presented in his famous book *The Wealth of Nations* (Smith, 1937). In economic terms the tax does not create deadweight loss.

Although Henry George is known for his ideas of land taxation and the single tax theory, the Henry Goerge Theorem was created by economists in the 1970s (Fu, 2005). The Henry George Theorem states that if a city has an optimal amount of residents, the aggregate differentiate land rents can cover the cost of public goods.

A tax on land can be levied for example imposing a tax of a fixed sum per a square metre of land, a tax on land rents or a tax on the value of land. The relationship between land value and land rents can be written in a mathematical form by a formula 2.1:

$$V = \frac{Y}{(1+r)} + \frac{Y}{(1+r)^2} + \dots + \frac{Y}{(1+r)^n} \quad (2.1)$$

, where  $Y$  is the annual rental income yielded from a piece of land for the next  $n$  years. The formula shows that the market price for the piece of land in equilibrium will equal the present discounted value of the stream of future income. When the interest rate is  $r$ , the value of the land  $V$  is given by formula 2.1. (Dye and England, 2009)

In the case of  $n$  being infinite, the equation can be written as:

$$V = \frac{Y}{r}. \quad (2.2)$$

And it follows that if a tax on the value of land is levied and the rent remains the same while the landowner is not capable of passing any of the tax onto the tenant, the current value of land changes to:

$$V = \frac{Y}{r + tv} \quad (2.3)$$

, where  $tv$  is the tax rate (Dye and England, 2009).

The value, or market value of the piece of land has been reduced because of the tax. It can easily be seen that because the land value immediately falls by the full present discounted value of the future stream of tax payments, it follows that the whole burden of the levied tax falls to the owner of the land during to time the tax is levied. All the future liabilities of the tax are capitalized into the current market price if the current market value is the present discounted value of stream of future income.

From the equation 2.3 some interesting effects from the tax can be seen. For example a tax of 100% ( $tv = 1$ ) will decrease the value of  $V$ , but it will not be equal to zero. Because of the interest rate, there will be a return on investment. For example if the rent of land is \$1000, the tax rate is 100% and the interest rate is 5%. The

current value would then be \$952,38. The tax would then also be \$952,38, leaving the income to equal \$47,62 (Dye and England, 2009).

The relationship between a tax on land value and a tax on land rents can be characterized with an equation 2.4:

$$Tr = \frac{Tv}{r + tv} \quad (2.4)$$

The annual revenue from land rent taxation would be  $TrY$  whereas a tax on land value would generate an income of  $TvV$ . If the two taxes would generate the same amount of revenue,  $TrY$  would equal to  $TvV$ . The equation 2.4 informs that a 3% tax on land values equals a 37,5% tax on land rents if the interest rate is 5%. (Dye and England, 2009)

## 2.1.2 Partial equilibrium effects of land value tax

Coleman A (2009) studied the partial equilibrium effects of introducing a land value tax of 1% in New Zealand. The general equilibrium model which is going to be introduced later cover the economy-wide effects. A comparison to a property tax or capital value tax is also made.

Coleman A (2009) compares two scenarios where the land value tax is introduced. In the first option the tax is introduced in a number of years and in the second the tax is levied on some increment of land value above a starting value.

Coleman A (2009) draws on the analysis of Oates & Schwab in Dye and England (2009). The after income rental stream of land is given by the equation 2.5:

$$Y = (1 + \pi)^i Y[r, k, t] \quad (2.5)$$

,

where  $i = 1, \dots, \infty$  and  $\pi$  is the annual inflation rate of land rent. Market rates are considered as a function of real interest rate  $r$ , the land tax rate  $t$  and other factors  $k$  such as maintenance costs and expected gains or losses of capital due to owning the parcel. (Coleman A, 2009)

A nominal discount rate is approximated as  $(r + \pi)$ . When the tax rate is  $t$  the value of the property at the end of year  $i$  is  $V_i^t$ . (Coleman A, 2009)

The discounted value of future rents less taxes and payments is given by the equation 2.6:

$$V_0^t = \sum_{i=1}^{\infty} \frac{(1+\pi)^i Y[r, k, t]}{(1+r)^i (1+\pi)^i} - \sum_{i=1}^{\infty} \frac{kV_0^t (1+\pi)^i}{(1+r)^i (1+\pi)^i} - \sum_{i=1}^{\infty} \frac{tV_0^t (1+\pi)^i}{(1+r)^i (1+\pi)^i} \quad (2.6)$$

By solving for  $V_0^t$  we get the purchase price given by 2.7

$$V_0^t = \frac{Y[r, k, t]}{r + k + t} \quad (2.7)$$

The change in land value if real rents are constant can be calculated as in equation 2.8

$$\frac{V_0^t - V_0^0}{V_0^0} = \frac{-t}{r + k + t} \quad (2.8)$$

The equation 2.8 suggests that the lower the real interest rate  $r$  and gains  $k$  the higher the impact of tax is (Coleman A, 2009). Also the conclusion that introduction of a tax reduces the wealth of existing land owners can be made.

### 2.1.3 General equilibrium effects

Coleman A (2009) analyzes the general equilibrium effects of a change from tax-free environment to one with a land value tax. First he focuses on the impact the tax has on rents. The equation 2.9 shows the changes of rents relative to changes in land prices (Coleman A, 2009).

$$\frac{V_0^t - V_0^0}{V_0^0} = \frac{(Z-1)(r+k) - t}{r+k+t} \quad (2.9)$$

From the equation 2.9 it can be seen that if the revenue from land value tax is used to reduce other tax rates and increase the amount of disposable income or if the

supply of housing is elastic, the fall in land prices will be smaller than suggested by 2.8 in subchapter 2.1.2 (Coleman A, 2009).

## **2.2 Neutrality of land value taxation**

### **2.2.1 Factors contributing to neutrality of land value taxation**

The classical view of the land tax is that it is ideal since it is neutral towards other commodity and factor prices (Bentick, 1979). In taxing consumer products there are side effects due to raised prices and their effects on demand. A tax might cause such a rise in prices that it created welfare losses. Some output might not be produced at all because of a tax. The losses due to taxes are called the excess burden of the tax or deadweight loss resulting because of the tax. As discussed earlier in section 2.1, in theory the demand and supply do not shift when a land value tax is introduced.

It can be argued that by land value taxation revenue is generated in an economically efficient way. That is why it can be called a neutral tax in theory. By definition it does not alter the markets in any way.

Bentick (1979) argues that it is not simply so that we could assume that this view holds in a dynamic world and specifically toward the allocation of saving. As Bentick (1979) concludes in his article, a land-wealth tax which is based on future land rentals via current market value causes the tax to be levied before the rentals on which the tax is based on. In the study he develops a measure of the resource cost of the effect. According to the study, the effect can be reduced by using imputed current rentals instead.

Arnott and Petrova (2006) present a model of a neutral taxing system of raw site value tax, a tax on structures and a tax on post development site value. Different rates are chosen for raw site value, structures and post development residual site value. Arnott and Petrova (2006) proved that communities could create a neutral tax system even without being able to assess the value of undeveloped land properly.

Brueckner (1986) studied the long run effects of lowering the tax rate of improvements and raising the rate of land, also called gradation. The impacts on level of improvements, value of land and the price of housing were measured. Also short run effects were examined. Brueckner (1986) analyzed the impact with a modern approach with two scenarios, one where the prices were exogenous and one where they were allowed to change.

First assumption of the study was that the purpose of the property (residential, commercial, industrial) was ignored. All structures were treated as a homogeneous class. First, the tax was only introduced to a small portion of the housing market where the price of housing can be considered exogenous. With this case, the study showed increases in levels of improvements per acre and land values. The increase of land values is against the theory of land value taxation, which states that the value should fall when a tax is introduced. (Brueckner, 1986)

The second case investigated by Brueckner (1986) is the case of a whole housing market, where the prices are allowed to change. In this case the level of improvements also increased and the price of housing as well, but the value of land decreased. Brueckner (1986) states that they decrease because lower housing prices reduce the profitability of development. Even though Brueckner (1986) used gradation, the results can be, according to them, predicted to be similar with pure land value taxation.

Brueckner (1986) also studied the short run effects of introducing gradation. The result is windfall losses for the more developed parcels and gains for the less developed. These results are also against the previously common theory of land value taxation.

Tideman (1982) argues that the tax that for example Bentick (1979) and Mills (1981) have used in their studies cannot be considered as land value tax and that real land value tax is neutral even though the results of Bentick (1979) and Mills (1981) suggest otherwise. Because Bentick (1979) and Mills (1981) define how the land is used and calculate the present value of land in terms of future returns the land value in their studies depends on how the land is used. Tideman (1982) also points out that if the value of land is defined in terms of future returns, also opportunity costs and depreciation of the improvements should be observed.

Tideman (1982) suggests that the value of land should not be considered as a stream of future returns but as the price it sells. And the value of land with improvements should be calculated under the hypothetical condition where there are no improvements because the improvements cannot be economically removed from the site (Tideman, 1982). The price would be based on selling prices of vacant land of similar nature or the present value on net returns if the land were bare (Tideman, 1982).

Tideman (1982) argues that if the value of land would be calculated as a price it

would sell regardless of how it is presently used, the value is closer to what could be observed and the amount of tax levied to a value based on this calculation would be independent of the use of the land - it would be neutral.

Skaburskis (1995) studied the link between method of financing and the intensity of urban land use. He focused on the substitution and the move from property tax to a land value tax and the timing effect of this. The anticipated result of the study was increased intensity of development on a parcel. Density and intensity were measured as the amount of capital per some amount of land. An increase in capital intensity would mean increased density of building and population.

As in subsection 2.1.2 the equation 2.8 shows, land value tax affects the wealth of existing landowners when the land value tax is introduced. But there is a separate question about how it influences prospective landowners in year 0. Because the purchasing price falls by the discounted amount of the future tax payments, the decision of a prospective home buyer does not change if there is no borrowing constraint (Coleman A, 2009).

If there is a borrowing constraint in the form of debt servicing constraint relative to income, it does not alter the decision. For those who face difficulties with the deposits, a tax may alter the decision by reducing the deposit, which usually is a percentage of the purchase price (Coleman A, 2009).

If a land value tax is introduced gradually over time, the possible problems of existing landowners caused by insufficient preparation may be avoided. The value can then be described with an equation 2.10 of the form

$$V_0 = \frac{Y}{r + k + \tau} \tag{2.10}$$

where  $\tau$  is

$$\tau = r \sum_{i=1}^{\infty} \frac{t_i}{(1+r)^i} \tag{2.11}$$

The result of gradual introduction of land value tax is a smaller fall in land value than with an immediate introduction (Coleman A, 2009). Of course also the tax revenues raised are smaller in the case of gradual introduction.

Another form of introducing a land value tax is levying it only for increments in land

value over some initial base level. The tax could then be considered as a capital gains tax as it is only levied on increments of wealth. This form of introduction is more complicated to model but for example (Coleman A, 2009) argues that the tax causes the initial value of the land to fall by the discounted amount of future tax stream. The increments in the value will disappear until the gains from other reasons have increased enough to cover the loss in value caused by tax stream.

## **2.2.2 The capital intensity effect**

Capozza and Li (1994) have studied the choice of residential or commercial development. Just as in other investment decisions, a choice of timing and intensity or level of capital investment must be made. In their article Capozza and Li (1994) model the choice with an optimal-stopping framework. There is a vast amount of research made about optimal timing of real investment decisions. The focus of this study is on the decision of land use, which of course follows from other research. The difference with decision of land use in comparison with other investment decisions is that the decision is made once rather than continuously.

Capozza and Li (1994) show that optimization of timing and intensity simultaneously causes the rents to rise and delays development decisions.

## **2.2.3 The timing effect**

Another interesting term, a timing effect, is analyzed in some papers such as Oates and Schwab (1997) and Bentick (1979) and Mills (1981). It means that land value taxation may cause a distortion in the timing of the improvements. Improvements with earlier stream of net receipts may be preferred to other improvements on unused land.

The basic theory of land taxation suggests that because there is a tax to pay regardless of what is developed onto the piece of land, it is more expensive to keep land with no improvements than without taxation it would be. Because it would be just as expensive to hold land where there is no improvements, no one would do it. This argument, however, is against the neutrality-argument made before. If a land value taxation is not affecting in any way the the supply and demand of land, how can the incentive to development be explained? If the tax causes development of land earlier than without a tax, it is clearly not a neutral tax.

The key to this debate is how the land is valued. If the land is valued in its actual use and not its potentially highest and best use, it may induce earlier development Oates and Schwab (1997). But if the land is valued in its highest and best use, land value taxation is neutral in a temporal setting (Dye and England, 2009).

As Vickrey (1970) argues, the important question is whether the landowner can influence in the assessment of land value. Any assessment method that does not rely on the decision of landowners will be neutral. According to him, any assessment made with frozen land use decisions generates neutrality. The assessment can be made any time if the decisions cannot be made during the assessment period (Vickrey, 1970).

By using the highest and best of land we can calculate a maximum rental income that the piece of land could earn to the owner in the present and in future. The current and future stream on liabilities would then be capitalized into the current value of the land. An immediate capital loss to the landowners equal to the liabilities now and in future occurs. But there is no difference in the use on land. Hence land value tax is neutral in the sense of timing. (Dye and England, 2009)

Capozza and Li (1994) take into account the importance of intensity of land use in the spatial structure in urban areas. The simultaneous optimization shows that delaying may be optimal even indefinitely. The non-neutrality of pre- and post property taxes is analysed when the rents are uncertain. It is concluded that changes in tax rates cause changes in rural and urban value and city sizes. (Capozza and Li, 1994)

## **2.3 Challenges of land value taxation**

### **2.3.1 Assessing the value of land**

Throughout history land has been taxed based on different criteria such as the size of the area or agricultural rent generated. Property has been taxed for example based on number of windows and chimneys or the estimated property value. There is a trade-off between efficiency and the ease of collecting tax. By taxing the value of land only, there is an incentive to use the land and build on it as the improvements do not increase the tax amount collected. But on the other hand value of unimproved land is not easily calculated. By taxing properties the value is easily calculable using market transactions but there is no incentive to make improvements as they

increase the amount on tax collected. Most jurisdictions have two-rate property taxation (Arnott and Petrova, 2006).

Assessing the value of unimproved land can be seen as a challenge. There are two main alternatives discussed in the research, the residual site value and raw site value. Residual site value is calculated by property value less structure value measured as depreciated construction costs (Arnott and Petrova, 2006). Raw site value is the estimated value of the site without any buildings. In theory, a raw site value tax would be neutral, but its assessment is more difficult and it is prone to abuse.

### **2.3.2 Taxing housing as an asset**

Housing is both consuming the flow of services of living in a house. It could then be argued that housing should be covered by the VAT just as any other form of consumption. On the other hand a property is also an asset to a home-owner and it could be argued that housing should be taxed just as any other asset or savings. If the house is rented, the renter consumes and the owner has an asset. In the case of owner occupied housing, the owner is both renter and the landlord.

### **2.3.3 Property tax and the deadweight loss**

A tax on buildings and improvements is part of the property tax. It can be considered a production cost because the person who builds and maintains a property must pay a tax based on the value of the property. An improvement such as a new heating system costs the owner also in taxes as it adds to the value of the property. Rybeck (2004) estimates that by using a net present value calculation a one-time 9-17% tax in sales of building labor and materials equals a 1-2% property tax on buildings.

The choice of taxing property versus land can be considered a choice between efficiency and ease of taxation (Arnott and Petrova, 2002). Because taxing property value creates distortion as more valuable properties are taxed more, there is some amount of deadweight loss connected to property taxation. The amount depends on the type of property tax system used. Marshall and Guillebaud (1961) analyzed the amount of deadweight loss using a partial equilibrium model where the supply of land is treated as inelastic and the supply of property fully elastic. In the Marshallian analysis the taxes are levied based on rents and not values.

Mieszkowski, 1972 famously analyzed the deadweight loss with a general equilibrium model with a static perspective and in this analysis the tax is viewed as a tax on capital. In his model there were only one sector and three factors labor being immobile. Later Brueckner (1981) studied how the mobility of labor affects the incidence of property taxation in two communities.

Arnott and Petrova (2006) focus on Marshall's partial equilibrium perspective but also have a dynamic analysis using capital asset pricing theory. It assumes the tax is falling on values rather than rents.

Many have also focused on neutrality of property taxation where there is no deadweight loss as the tax has no effect on timing or density of building. Tideman (1982) and Vickrey (1970) argued that site value taxation is neutral if post-development site value is defined as the market value of the land prior to any improvements such as buildings. The definition was named raw site value. Later many have focused on the practical matters, how is raw site value accurately calculated.

A combination of taxing the value of unimproved land and buildings is in use in many areas such as Denmark, Australia, Hong Kong, Singapore, South Korea, Estonia, Canada and USA (Arnott and Petrova, 2006).

Arnott and Petrova (2006) analyze a subset of three taxes, one for raw land value, one for post development structure value and one for post development residual site value. Arnott and Petrova (2006) also study the results from a property tax system used in Canada where raw land value is excluded from taxation and property value after development is taxed. The value of structure and residual site value are then taxed at the same rate  $\tau$ . It is assumed that agricultural rent is zero and floor rent grows at a constant rate  $\nu$ . The present value of property tax revenue is maximized when post-development property tax equals the growth rate of floor rent.

In Arnott and Petrova (2006) article the base case model is a model of property development without taxation. The revenue to finance government purchases is collected by a lump sum tax. The base model is compared to a model where the lump sum tax is replaced with property taxation. Three different property tax systems were analysed, the "Canadian" system (where property value is taxed after development and pre-development land value left out), a simple system (where pre-development land value and post-development property value are taxed with the same rate), the residual site value tax system (with the exception of structure value untaxed) and a two-rate property tax system (with the exception of structure value

taxed a different rate). All four systems are distortionary. The article explains how the distortion is created and of what magnitude is the deadweight loss. (Arnott and Petrova, 2006)

The Canadian system does not affect to the density of development but there is a timing effect: the development is delayed. Both the simple and the two rate property system cause earlier development but discourage density. The residual site value system also has a positive effect in development time but at lower density. (Arnott and Petrova, 2006)

The results suggest that when revenue maximizing tax rates were calculated, they were lower than the rates used in many jurisdictions meaning that some jurisdictions might be on the wrong side of the Laffer-curve (Arnott and Petrova, 2006). Other results include a positive relationship with the elasticity of substitution in the production of structures and the deadweight loss in every other system except the Canadian. The revenue maximizing tax rate was found negatively related to the deadweight loss.

Coleman A (2009) concludes that according to his analysis a land value tax seems to be more progressive than property tax. But if land value tax were assumed to replace other forms of taxes the nature of changes in other tax rates of course have a huge impact on progressivity.

The usual subject of debate in incidence of property taxation is whether the property tax is considered a user charge for public services or a distortionary tax on the use of capital in housing. In their paper Muthitachoen and Zodrow (2012) focus on the latter view and analyze the excise tax effects of introducing a property tax. The importance of the excise tax effects is argued by Gravelle (2007), who estimates that it accounts 30-40% of the property tax burden in the U.S.

Tax incidence has been analyzed before by for example Harberger (1962) and Zodrow and Mieszkowski (1986). The previous results of the incidence of property tax have included the profit tax component, in which the after-tax rate of return for capital is lower meaning the burden of the tax falls to all capital owners, and the excise tax component in which the different tax rates create differences in consumer prices and returns on labor and land.

As said, Muthitachoen and Zodrow (2012) focus on the excise effects of property taxes meaning the impacts of a property tax to consumers, suppliers of labor and owners of different types of land. In the model the economy is considered a small

open economy with elastic supply of capital. The neighbouring jurisdictions are considered to hold their tax policies constant during the analysis. In the model there are four production sectors, housing, manufacturing, services and agriculture. There are three factors of production; capital, labor and land. The model has some characteristics that differ from prior models, labor is considered partially mobile and land immobile across sectors. Property tax applies to both capital and land used in all other sectors except for agriculture. (Muthitacharoen and Zodrow, 2012)

An important difference of the Muthitacharoen and Zodrow (2012) study and earlier papers on the incidence of property taxation is the timing period. Muthitacharoen and Zodrow (2012) use an intermediate run, where labor is considered only partially mobile and land immobile.

Labor is typically considered fully mobile and it bears only little if any of the tax. In the long run land can be considered mobile and all parts of the tax capitalized into land values would be equally distributed among all uses. In the shorter, intermediate run land is considered only partially mobile allowing the results from the transition period to a new equilibrium to be studied. (Muthitacharoen and Zodrow, 2012)

The results of the model Muthitacharoen and Zodrow (2012) used differ from the models used to describe the long run incidence results of property taxation. This is due to the differences in the models. The production costs of all sectors where the tax is appointed rise, especially in the capital intensive sectors. Because capital demand and output falls especially in the tradable sector, manufacturing, since forward shifting is not possible. In the non-tradable sectors, housing and services, forward shifting takes place. (Muthitacharoen and Zodrow, 2012)

Because forward shifting is not possible for manufacturing sector, wages must fall. Labor moves from manufacturing to non-tradable sectors and wages experience urge to fall. This limits the amount of forward shifting. These results are not similar to the results from previous models where the consumer prices rise by the full amount of the property tax. Land rents fall in the taxed sectors and increase in the untaxed sectors. Land bears the full land component of the tax and some of the capital component due to backward shifting. (Muthitacharoen and Zodrow, 2012)

Because the taxes on buildings cause higher production costs, they result in lower production. Existing owners can battle the cost of taxes with few strategies. They can either let the value of the property decline or tear it down to avoid the taxes. This causes the supply of available properties and available properties in good condition

to diminish (Rybeck, 2004). The prices rise because of diminished supply and the rents of residential and commercial properties go up.

## **3. FINANCING INFRASTRUCTURE WITH LAND VALUE CAPTURE**

### **3.1 Land value taxation and urban development**

#### **3.1.1 Infrastructure projects and land value**

After the global financial crisis and recession of the early 21st century there has been pressure all around the world to cut public spending to balance the budget. Governments are reluctant to increase debt, which means that new sources of capital must be found to be able to develop transportation. This part of the study analyzes the method of land value capture as funding for public transportation. There is a clear connection between available transportation infrastructure and land use and numerous studies have shown the correlation between transport facilities and increased land value (Doherty, 2004).

Areas with good transportation opportunities tend to be valued higher than areas without them. Transportation decisions are a core part of urban city planning. The land use and accessibility can be controlled via reasonable transport development decisions.

Land value capture can be used to fund public projects such as investment in infrastructure. In the process of land value capture a part of the increased land value is taken by the government to fund public services. It may be done by taxing or collecting fees. The land value capture may be done by raising taxes on land values impacted by investments in infrastructure. Because of that the amount of speculation decreases and it increases holding costs creating an incentive to develop unused land (Doherty, 2004).

Already in the 1800s land values were assessed higher on the paved streets than on streets without paving in the district of Columbia (Rybeck, 2004). Although paving benefited everyone due to better air quality and easier access, the homeowners on the paved streets benefited the most.

To fund large infrastructure projects such as train lines, tax revenue and user fees can be collected. The burden theory focuses on the question of who should pay (Nakagawa and Matsunaka, 1998). If public transportation improvements only lead to increased user convenience, then users should bear the cost according to this viewpoint. Other beneficiaries of transportation improvements are different industries and the society in the form of ensuring freedom of movement. External effects might be positive such as increased land values and negative such as increased level of pollution. Also the need to distribute the burden for generations equally complicates the situation.

Nakagawa and Matsunaka (1998) state that ideally a combination of funding methods such as taxation and user fees should be used to reach the best result. Also according to Nakagawa and Matsunaka (1998) investment should match need, projects should be efficiently realized and the burden should be fairly and equitably distributed. In short adequacy, efficiency and fairness is needed.

Transportation has been funded mainly by the public sector in most of the countries through out history but interest in private sector funding is increasing. In theory the market mechanism should make sure that improvements take place, but it does not fulfil all of the three requirements as it does not take into account the external effects or social rights.

User costs and total costs to the society differ with transportation due to external diseconomies. Welfare economics states that the costs for users and society should be equalized to maximize welfare. Environmental taxes are an example of a way to do that. Another form of external diseconomy is the influence of a car entering traffic flow and it can be battled with a congestion tax. (Nakagawa and Matsunaka, 1998)

Positive externalities due to traffic are for example increased land values and realized social rights.

To distribute the burden of externalities, direct methods and indirect methods are used. A tax is an example of a direct method and influencing the demand of the transport type (to encourage people to use other forms of transport instead) is an example of an indirect method.

A significant portion of the value capture literature focuses on reporting empirical findings on the incidence of rising land values near infrastructure projects. As Smith and Gihring (2006) put it, a shift from testing hypotheses to practical application

value capture has been made. Longitudinal models are used in research to predict the value increases and also capturable revenues can be estimated.

A large portion of research about value capture focuses on cities in the US. Compared to for example Asian and South American cities, the US cities tend to be of lower density and auto dependent. However also numerous studies such as for example Ortiz (1996), Meakin (1990) and Tsukada and Kuranami (1990) have focused on cities outside of the US. In general the problems of the use of land value capture in developing countries can be found in inadequate recording and lagging assessments (Smith and Gihring, 2006).

Land value finance mechanisms include special assessment zones, tax increment finance, air rights, negotiated exactions, joint development, enterprise zones and transit oriented areas (Medda, 2012). Value capture methods can be categorized as three main groups which differ in terms of their practical applications. These groups are betterment tax, accessibility increment contribution and joint development (Medda, 2012). The same grouping is used in this study.

Value capture mechanisms include a degree of risk related to cyclical behavior in real estate and transport markets. If the estimations of cyclical movements are incorrect, the provision of sufficient revenue might be difficult to achieve. As Medda (2012) noted, "in order to effectively demonstrate the profit potential of accessibility and to spur incentives in transport investments, public and private actors need to gain a practical understanding of the theoretical results and data analyses related to the accessibility windfall values because these indeed provide valid support for the implementation of land value capture in urban areas".

When large infrastructure projects are built, the values of properties and land rise. For example the extension of the Jubilee line in London caused an increase in values measured in billions of pounds. Because the project was funded by taxpayers, it could be described as a transfer of wealth from a large number of taxpayers to the property owners who benefited.

Harrison (2006) discusses the financing of mass transit in Britain. His approach is to integrate private markets and public goods. First Harrison (2006) discusses how the decisions of public spending are made. In the paper it is shown that projects with benefit-to-cost ratios of 2:1 are rejected if the projects are funded by taxpayers money. But if distortionary impacts are taken into consideration, a 1£investment actually needs a 1.3£return to break free. The distortionary impacts are what make

mass transit projects unviable with public financing even if private investors would be willing to invest with the same returns (Harrison, 2006). Harrison (2006) sums up that distortions in taxation are the common source of the problem with the partnership of public and private markets.

Rybeck (2004) states that taxes can be used to capture land values to finance infrastructure projects. These type of taxes also motivate the development of land as tax rates on assessed buildings are lowered and rates on land are raised. Rybeck (2004) sums the challenges of states and local jurisdictions as follows:

- Increasing the supply of affordable housing
- Providing and maintaining essential transportation infrastructure
- Reducing traffic congestion
- Preserving rural conservation, regration and agricultural land
- Reducing air pollution
- Accomplishing the above with a balanced budget

Rybeck (2004) points that although these policy goals can be thought to compete with each other in terms of resources allocated, the relationship between property tax and real estate markets can be seen as the solution.

There have been speculation whether the increased land values are enough to finance infrastructure projects. Both Rybeck (2004) and Riley (2001) found surplus values in Washington D.C.'s metro and London tube extension.

Even if numerous examples of transport projects indicate that there is a positive relation between new infrastructure and development of the area, there are other factors that affect the development greatly.

Salon and Shewmake (2011) conclude these factors as the increment of accessibility, the rate of overall growth in the area, availability of developable land and zoning incentives and constraints. The increment of accessibility forms due to the new infrastructure project for an average person. This depends on the extend of the transport system, the amount of riders living or working near the station or transit opportunity and the level on congestion on other transport possibilities. Other factor is the rate of overall growth in the area and another the availability of developable land near the station or transport opportunity. In suburban areas the impact of a new station might be larger than in already developed areas. Zoning incentives and

constraints may influence the development in either direction. Development policies may increase development of the area by for example offering density bonuses. (Salon and Shewmake, 2011)

### **3.1.2 The impact of higher land values on development of the area**

In his article Rybeck (2004) examines the value capture technique used to finance Washington D.C.'s new infill Metrorail station. After the opening of the metro line in Washington, property values and rents on housing near the stations rose faster than the average pace in the area.

Because the building of transportation options raises the values of properties and land nearby, developers start to look for cheaper locations. Once locations further away are developed, the occupants then start to create political pressure to extend the transportation possibilities. According to Rybeck (2004) this sprawl creates more use of auto travel and thus pollutes the air and creates political and economic dependence of petrochemical suppliers. Travel times to work extend which leads to lower productivity and pollution and auto accidents endanger health (Rybeck, 2004). The sprawl causes the amount of investment for transportation per person to rise and underdevelopment of areas with transportation opportunities.

The sprawl is created because of how homeowners profit from owning a site (Rybeck, 2004). Developers can either buy a site, develop it and sell it or wait for the value to go up because of for example infrastructure improvements, higher wages and population growth. Owners of undeveloped sites can hold the sites waiting for the value to rise. This speculation creates scarcity and results in real increases in land rents and prices (Rybeck, 2004).

Rybeck (2004) also appoints that this kind of speculation can lead to landowners seeking rents that are too high and businesses failing which leads to rising unemployment rates and relocation of families. Ultimately the situation can lead to a recession.

## 3.2 Value capture methods

### 3.2.1 Betterment tax

Betterment tax is used to finance transportation with the land value added by public investment (Medda, 2012). A betterment tax is levied to beneficiaries of the transport investment, benefits being increased accessibility, lower level on congestion and air pollution and lower transport costs. The betterment tax is considered an efficient, equitable and easily understood tax (Medda, 2012). Betterment tax may also create incentive to develop land, as it reduces land speculation (Medda, 2012).

Examples of betterment tax in use are studied in more detail in the next chapter.

The difficulties in implementing a betterment tax system include lack of information about the land use in the area of question. Especially in developing countries registries for residential properties may not be complete and estimating the effects can be difficult or impossible (Medda, 2012). The collection of the tax can also cause problems with delays. Because betterment tax is a tax on value of land, for some individuals who own land but are not cash-rich the payments may cause to be troublesome or even cause movement out of the area (Medda, 2012). Projects which benefit those who can pay the levy can be argued to increase socio-spatial segregation (Medda, 2012).

Coleman A (2009) cover two scenarios of betterment, first being some improvement in infrastructure and second land rezoning for example from agricultural to residential use. The rise in land value is termed betterment. Coleman A (2009) considered both the general land tax and the incremental land tax for taxing betterment.

First Coleman A (2009) studied the change in land value from  $V_0 = Y/(r + k)$  to  $V_0^* = Y^*/(r + k + t)$ . The annual rental stream  $Y$  rises to  $Y^*$  and an annual land tax rate is levied. To find the rate which captures all of the betterment (where  $V_0$  equals  $V_0^*$ ), the  $t$  must be solved as in formula 3.1 below

$$t = \frac{(r + k)(Y^* - Y)}{Y} \quad (3.1)$$

The present discounted value of the tax flow is  $tV_0^*/r$  (Coleman A, 2009). If the whole cost of the project wanted to be covered with land tax revenue, the cost  $P$

would equal to the discounted value of the tax flow. The appropriate rate can be calculated with the equation 3.2

$$t = \frac{r(r+k)}{Y^* - rP} \quad (3.2)$$

Coleman A (2009) explains that depending on the benefit-cost-ratio (BCR), which is  $Y^* - Y/rP$ , the whole project cost can be covered with revenue from a flat land tax and still allow some value uplift if the  $BCR > 1$ . If  $BCR < 1$  the full financing with a land tax leads to declined property values (Coleman A, 2009).

If only real incremental value of land is taxed at rate  $t$ , the value change is described in formula 3.3

$$V_0^* = \frac{Y}{(r+k)} + \frac{Y^* - Y}{r+k+t} \quad (3.3)$$

where the first term on the right side is the value not affected by the project and the second the amount of rise in value (Coleman A, 2009). If the tax is levied to only the second part at rate  $t$ , the present discounted value of tax revenue is  $[t(Y^* - Y)]/[r(r+k+t)]$  and the tax rate which is enough to finance the project is presented with an equation 3.4

$$t = \frac{r+k}{(Y^* - Y)/rP - 1} \quad (3.4)$$

The revenue collected with this rate can finance the project if and only if  $BCR > 1$  (Coleman A, 2009). The higher the BCR the lower the tax rate.

The capital gains tax on land is a one-off annual real capital gain tax and the incremental land value tax is an annual tax. If the capital gains tax rate is  $c$  and the incremental land value tax rate is  $t$ , they can be compared with equating the present discounted revenues as in formula 3.5

$$t = \frac{(r+k)c}{(1-c)} \quad (3.5)$$

Cash flows from incremental land tax are spread over the future and cash flows from capital gains tax are due when the capital gain is realized (Coleman A, 2009).

### **3.2.2 Accessibility increment contribution**

Medda (2012) groups all fiscal incentive instruments which earmark future revenues to finance current expenses under the name of accessibility increment contribution. The tools are designed for urban areas with lack of accessibility and their purpose is to create growth with public improvements. Private investors are encouraged to invest in the area meaning that the public expenses are financed with the enlarged amount of taxes. (Medda, 2012)

One of the most popular fiscal tools in this category is the tax increment finance which is used in urban redevelopment and transport investments (Medda, 2012). Tax increment finance is a commonly used tool in the US and cities such as Chicago have suburbs developed around transit opportunities with this financing tool (Medda, 2012). The idea is simple, the local government and a private developer enter into an agreement where the government's investment is reduced if the developers rate of return exceeds a target value. Tax increment finance has been argued to be controversial since it has an impact on other district financing. Also the tax burden may not fall entirely only to the tax district, but to other residents of the city as well (Medda, 2012).

In all accessibility increment contribution mechanisms, the relationship between better transportation systems and the increase in property values is a fundamental requisite (Medda, 2012).

An example of an application of an accessibility increment contribution scheme is a private sector development of specific hubs in transport network with the use of concession and tax reliefs. These kind of projects have been successfully seen in for example Brazil (Medda, 2012). On the other hand Smolka and Furtado (2002) studied the effects of upgrading the zoning system in Curitiba, Brazil and concluded that many negative effects including speculation of land development and displacement of low-income families were seen in the area.

Both the betterment tax and accessibility increment contribution need close attention and implementation from local government. As Medda (2012) argues, political support and consensus of economic interests of residents and industry are important for these fiscal regimes to work.

### 3.2.3 Joint development

The previous land value capture methods discussed both need active implementation and land value assessments. If this is not possible, using methods such as betterment tax and accessibility increment contribution might lead to land value speculation and even to land asset bubbles (Medda, 2012).

Rybeck (2004) and Cervero (1994) both study the effects of joint development in Washington D.C.'s metro line. Joint development occurs when both the public sector and private sector recognize the benefits of financing a transit project. Joint development includes for example air-rights development, ground-lease arrangements, station interface of connection-fee programs and they are designed to mutually benefit both public and private interests (Cervero, 1994).

Cervero (1994) focus on how transit investments affect office market conditions such as rents, vacancy rates, densities and the amount of commercial construction near the sites. According to Cervero (1994) financing a metro station with joint development raised office rents significantly, lowered the vacancy rates of office buildings, raised the shares of regional growth in the area. The study concluded that in areas with similar market conditions, the joint development of combining private real estate and public transit investments seemed to be a favourable means of financing transit projects (Cervero, 1994).

In Japan, real estate developers built transit systems and cover the costs from sales of developed sites and the practise could reasonably be extended to also public sector (Smith and Gihring, 2006). The risks of financing the transit systems could then be shifted to the public sector along with the financing.

One famous example of urban transport property development is the Mater Hill station in Brisbane, Australia where a hospital has been built on top of a bus station.

Joint development can be seen as a win-win situation, as Medda (2012) put it. For the private developer there are improved accessibility and an increased amount of potential customers meaning higher rents and occupancy rates for real estate and for the public sector the construction costs are lower. Of course there are also situations when joint development does not work in such a miraculous way. During 1980's the Washington DC metro joint development project acquired only 0,7% of the annual revenue (Medda, 2012). One reason for the unsuccessfulness in this case might be the lack of experience in the the real estate market (Medda, 2012).

Joint development method can be seen as a easily applicable land value capture mechanism as it is technically straightforward and since it does not involve fiscal mechanisms, there are no issues with equity (Medda, 2012).

As discussed in section 4.2.1 the development of both residential and commercial building grew despite of the severe depression during the time. As Oates and Schwab (1997) concluded, development within the boundaries of the city area exceeded the development in suburban areas contrary to national trends.

The metroline station in Washington DC also discussed earlier is perhaps the best example of value capture financing in action. During the 1990s Dr. Marc Weiss organized a group of landowners after the cost of the project was declared too high for the public budget at the time. The landowners offered \$25 million and Congress offered an additional \$25 million of general obligation bonds. A Metro Benefit Assessment fee was created and all property owners withing 2000 feet were obligated to retire the debt service of \$25 million of general obligation bond sold by the district (Rybeck, 2004). The fee was based on property values and is thus only partially an example of a value capture technique as it uses the property taxation. With this method some of the burden of owners of vacant parcels shifts to owners of developed properties (Rybeck, 2004).

Rybeck (2004) examines the effects of value capture with a hypothetical example, where a metro line station is built close to two parcels. There are two hypothetical situations, a vacant parcel A with a land value increase from \$200 000 to \$250 000 and a property B with the same land value increase. On the parcel B there is also a building valued at \$750 000. Only the value of land increases due to building the station. If \$1000 in total annually were collected to finance the station, \$500 would be collected from each if the value-added method was used. If a property tax surcharge was used, the owner of parcel A would pay \$200 and owner B \$800 regardless of the amount of value the metro station creates. (Rybeck, 2004)

### **3.2.4 General land-based property tax and other revenue sources**

Tideman (1982) and Borhart (1994) conclude that by focusing only to value increments near transportation projects, the full impact of the rising values is underestimated. A greater revenue base could be reached if the whole metropolitan area were appropriated with a general land-based property tax.

Another form on taxation to finance transportation could be taxes on congestion or

the use of transit systems and other revenue sources such as leasing publicly owned sites near stations (Smith and Gihring, 2006).

Other infrastructure finance approaches include special assessment districts, where some kind of charge is levied to a district based on some benefit the owners receive due to building new infrastructure. The charge may not be directly related to the benefit received, it can be a higher rate of some form of taxation or a fee. The line of the area is decided arbitrarily. (Rybeck, 2004)

Tax increment financing is an example of finance method used in infrastructure projects. It follows a simple logic that without investing in infrastructure, private investment in real estate will not occur (Rybeck, 2004). The revenue from taxes in a certain area is then benchmarked and all the revenue exceeding this amount will be directed to be used to finance new infrastructure. Because of assuming that there is no growth in the area, the funds can be thought to come at no cost. An investment made using these funds can be argued to not affect the budget. Compared to the two-rate tax system, the incentive to develop is lost with tax increment financing (Rybeck, 2004). Rybeck (2004) concludes that a two-rate tax system uses market forces and creates an incentive not present in other forms of financing infrastructure. With the two-rate system there is no need to draw artificial lines, as the owners who benefit the most in rising land values would also contribute the most naturally. Rybeck (2004) also states that on the other hand the revenue received from the two-rate property taxation is commonly directed to the public funds and not to a single fund used for infrastructure.

## 4. INCIDENCE OF LAND VALUE TAXATION AND VALUE CAPTURE METHODS

### 4.1 Incidence of land value tax

#### 4.1.1 Modelling the incidence of land value taxation

Henry George is known from his arguments towards land value taxation and equity. He argued that land values do not grow because of individual efforts but rather because of the community and the increased land value should be distributed among the members of the society who have caused it. According to him the value of land increased for example due to infrastructure and transportation opportunities.

As part of assessing any tax, equity or fairness should be taken into consideration. Because fairness is relative and because there are many different views of what is fair, there is no clear meaning of a fair tax.

Some kind of evaluation of fairness regarding taxes would be the progressive tax system, where people pay taxes according their ability. In most countries, a progressive tax system is used, where people with higher incomes pay more taxes than people with lower incomes. This is also known as vertical equity. In addition to vertical equity, there is also horizontal equity. Horizontal equity means that individuals with the same ability to pay are treated equally. Evaluating a tax system in regard of equity might prove difficult because an individual's ability to pay should be successfully measured. Also time period in which the measure is based on is important, because income for example might fluctuate. A lifetime's income on the other hand is a useful measure, because it leaves out the effect of fluctuations. (Dye and England, 2009)

Another definition of a fair tax system would be the benefit principle, where the people who benefit from public services would be the ones who pay for it. There is, however, clear difficulties with this system. The people who use public services the

most are for example welfare recipients, the ill and the elderly, who can afford them the least. Another problem with the principle is that some benefits are difficult to measure, for example the national security, education and roads. (Dye and England, 2009)

Evaluating the distributional effects of land value taxation is often difficult due to lack of proper data on land values. In New Zealand appropriate data exists and can be used to evaluate the impacts. Coleman A (2009) studied both community level and household level effects using data from Statistics New Zealand.

Coleman A (2009) examined variables such as median residential dwelling land value, median residential dwelling improvements value, median residential dwelling capital value, ratio of median land value to median capital value, household income and home ownership proportion. The hypotheses tested were that areas with high income have high land values per dwelling, areas with high income have high improvements values per dwelling, areas with high income have high capital values per dwelling and areas with high income have high land value relative to capital values per dwelling (Coleman A, 2009). The hypotheses test the progressiveness of the tax. The results of the analysis suggest that a land value tax is progressive meaning that it has a larger impact on households with higher incomes. A land tax is concluded as more progressive than property tax since a tax on land gives more progressive results than a tax on improvements. The results also suggest that homeowners may have a higher than average ratio of improvements compared to capital value than landlords and because of that a land value tax would affect landlords more than owner-occupiers (Coleman A, 2009). This is because homeowners tend to, in general, locate to areas with higher land values.

The results from Coleman A (2009) indicate that in general the incomes are positively related to land and capital values and that households of higher income would be more affected by a land value tax than those of lower incomes.

In the case of New Zealand, in addition to households with high incomes, a land value tax would fall also to a sector which is not paying any taxes prior to a land tax. That would be the foreign-domiciled owners of properties who pay no income taxes to New Zealand (Coleman A, 2009). This would result in a widening in the number of taxpayers. The general equilibrium simulations of Coleman A (2009) suggest that the indebtedness of the economy of New Zealand declines with the introduction of a land value tax since the amount of foreign capital needed to fund domestic property also declines.

The existing owners experience a loss of wealth as the tax is introduced unless the elasticity of supply is perfectly elastic. But even in that case the future tax flow is for the existing home owners to pay. In a micro level analysis the changes in other taxes are crucial. A land tax can be collected to be able to decrease the level of other taxes and of course those changes have a huge impact on a household level.

Coleman A (2009) concludes that owners of land-extensive residential properties, farms and forests would be the ones with highest losses in the case of land value tax. Also retired homeowners are faced with a loss larger than younger owners since their initial values of land and properties are generally higher and incomes lower so that a decrease in income taxation has a smaller effect on their overall tax burden. In the analysis of New Zealand also the ethnic groups and the number of children in the family have impact on how the tax affects.

The type of a land value tax affects different groups of people in a different way. A tax solely on the increase in land value would be gentler to the already retired part of the population. Also a gradual increase over time has a smaller impact of the already retired. Also specific, reduced, rates could be used for example for farmers if their situation was seen too difficult.

#### **4.1.2 The Wang Model**

Basic economic theory states that with taxes such as a tax on consumer goods the tax causes the demand and supply to move and falls both to consumers and producers. The amounts depend on the elasticity of supply of the good. With land value taxation the demand and supply do not shift, because the supply is perfectly inelastic (Dye and England, 2009). When the supply is fixed, the net price falls by the amount of the tax.

If landowners try to compensate their loss by rising rents, the demand would fall creating excess supply. Therefore basic economics suggests that the tax burden of land value tax falls completely to the landowner and cannot be shifted. (Dye and England, 2009)

Whether the tax rate is flat among different sectors of course also impacts the incidence of the tax. Housing and non-housing may be taxed with different rates to achieve some political goals. Wang (2011) analyzes the incidence of a land value tax that differs across sectors in a static, open economy general equilibrium model that divides the sectors to housing and non housing. Only the housing sector is

levied a land value tax. The model has three factors, land, capital and labor and two jurisdictions. The factors are considered mobile across sectors and all sectors need all three factors. Land is not considered mobile across jurisdictions.

Wang (2011) starts with a situation of an economy in equilibrium and of no land value tax. First only one jurisdiction levies a tax. After the introduction of a 1% tax a decrease of -0.1% to -0.7% in land rents in the taxing jurisdiction is reported (Wang, 2011). The relative factor intensities of each sector also have an effect. In case of capital intensive housing production and labor intensive non-housing, a -0.4% fall is encountered (Wang, 2011).

The model Wang (2011) uses can be compared to a two factor, two sector model Harberger (1962) used in his study already in 1962. The two-sector model proofs to be inadequate as it requires one sector to be considered land-intensive which is not a reasonable assumption. In the three-factor model the analysis of a situation where neither of the sectors are land-intensive can be made. The Wang's two-sector, three-factor general equilibrium model is an extension of the Harberger model.

Another model, created by Zodrow and Mieszkowski (1986) was used to analyze a situation of two jurisdictions in an open economy. In this model there are also three factors and two sectors, but there are differences in mobilities of the factors. Labor is considered immobile in Zodrow and Mieszkowski (1986) model and land mobile across sectors but immobile across jurisdictions. Housing is produced with capital and land only but the composing good is produced with the use of all three factors. This creates results where limited factor intensities are taken into consideration (Wang, 2011).

The important difference between the Wang model and other models, such as the models of Zodrow and Mieszkowski (1986) and Harberger (1962) is that it allows to examine the tax incidence of a differential land tax across sectors when the tax levied in other jurisdictions differs. The magnitude of tax incidence can be then calculated more accurately.

Other papers which have expanded the Harberger model are for example Mutti and Grubert (1985) and Muthitacharoen and Zodrow (2012). All computable general equilibrium models prior to Wang (2011) have concentrated on labor factor mobility across jurisdictions. The factor intensities are also not taken into consideration in prior models. In the Wang model the possible factor intensities are examined when mobility stays equal.

In the Wang model of open economy there are two symmetrical jurisdictions, where the elasticities of substitution between factors, the elasticities of demand for housing, factor intensities and jurisdictional sizes are equal. The sectors are divided to housing and non-housing and factors to labor, capital and land. All the factors are mobile across sectors, meaning land use can be switched from housing to non-housing. Labor and capital are also mobile across jurisdictions, land being immobile. (Wang, 2011)

In the model there are three groups of people, the capital owners, landlords and workers. The incomes are capital rents for capital owners, land rents for landlords and wages for workers. Each resident consumes a housing good and a non-housing composite good. The non-housing composite goods can be traded across jurisdictions but housing goods can only be consumed in the jurisdiction of residence. (Wang, 2011)

The incidence of a differential land value tax (meaning a tax levied to housing sector but not to non-housing sector) can be examined in different cases. The three cases are:

- Case 1: A tax is levied in only one jurisdiction.
- Case 2: A tax is levied in both jurisdictions simultaneously.
- Case 3: A differential land value tax is levied in one jurisdiction and a property tax on housing land and housing capital with equal percentage is levied on the other.

Wang (2011) states that in contrast to traditional view of land value taxation land will not bear the full burden of the land value tax that differs across sectors. Differentials in the land tax rate cause factor substitution and reducing of both sectors' land rents by less than the full amount of the tax. Some of the burden is then shifted to consumers of housing who face higher housing prices in the taxed jurisdiction. (Wang, 2011)

In the case where only one jurisdiction levies a tax, land rents fall in both jurisdictions and land bears some of the burden. Because housing production substitutes other factors for land, the demand for capital and labor rises and the returns on capital and labor also rise. Housing price rises in the jurisdiction where a land value tax is introduced, but on the other jurisdiction the effects on housing prices depend on intensities of factors.(Wang, 2011)

In the case where one jurisdiction levies a differential land value tax and other chooses from land tax and a property tax, the rents fall more if both jurisdictions undergo an introduction of a land tax. In both cases wages and housing prices rise. (Wang, 2011)

Wang (2011) also introduces a model for closed economy in his study and an optimal differential land taxation is discussed.

### **4.1.3 Fiscal impacts of land value taxation**

Coleman A (2009) studied the overall fiscal effects of introducing a land value tax in New Zealand with data from 2004, 2005 and 2006. The data used in the study presents the value of land and improvements separately. Also ratios such as the ratio of land value to capital value are calculated and the data is categorized into groups depending on the use of the land and property. Effects of taxing land value can then be compared to for example taxing capital value. The largest sector in New Zealand in terms of property values is the residential sector (Coleman A, 2009). Within the sector there is a significant amount of vacant properties which might be available for development if a tax would be levied (Coleman A, 2009).

He also points out that in New Zealand a single rate land tax would fall heavily on existing property owners within land based industries. The results suggest that some consideration is needed with land categorized and used as Agriculture or Commercial Forestry. Coleman A (2009) calculates potential revenues from a 1 % land value tax and from capital value tax. The capital value tax resulting a similar amount of revenue is 0,549% (Coleman A, 2009). A land value tax would raise more from agriculture and commercial forestry and capital value tax more from industrial/commercial/mining sector and residential sector would amount the same in either case. By excluding owner-occupied residential housing, a 40% loss would be caused in revenue (Coleman A, 2009).

Coleman A (2009) has estimated the effects of introducing a land value tax in a 20 year period. Land values in 2011 were assumed to equal those of 2006 after the imposition of the tax. Inflation was assumed constant 2%. Both the full land value tax (gradually introduced) and a tax on the increments of land value above the 2011 level were considered (Coleman A, 2009). Classification and excluding any categories such as owner-occupied housing or agriculture from the tax base creates incentive to reclassify the use in favor of the payer.

#### 4.1.4 The general equilibrium model of transportation, housing and residential location

The partial equilibrium assumption is tested by Anas (1982) with a general equilibrium model of transportation, housing, and residential location. Anas created the model for analyzing the housing markets. The model is also known as the Chicago Area Transportation/Land Use Analysis (CATLAS) model. CATLAS is a dynamic model that simulates the housing market in recursive periods of one year in length for a grid system of 1,690 zone (McDonald and Osuji, 1995). Anas simulated housing rents with the model, but not land rents or land values.

McDonald and Osuji (1995) test the hypothesis of land values reflecting the transportation improvements prior to the opening of a transit line. They examine a situation where the time of the completion of the line is known as are also the fares, travel times and other features. The following equation for estimating the change in land value is concluded in the formula 4.1 below:

$$\delta V_{t-i} = \frac{\delta V_t}{(1+r)^i} = \frac{\delta R_t}{r(1+r)^i}, \quad (4.1)$$

where  $t$  is the year the line opens,  $t-i$  is the year under the study,  $r$  is the real discount rate,  $\delta R$  is the permanent change in land rents from time  $t$  forward (McDonald and Osuji, 1995). The equation 4.1 tells the discounted addition to land value at time  $t$ . Although housing rents do not rise before the opening of the new line, the land values do (McDonald and Osuji, 1995). The relation between housing rents and land values can be formed from standard neoclassical theory of urban housing production. The production function for the housing services is

$$H = f(K, L), \quad (4.2)$$

where,  $H$  = housing services,  $K$  = capital and  $L$  = land employed in the zone (McDonald and Osuji, 1995). Constant returns to scale and elasticity of substitution of  $\sigma$  are assumed.  $s_K$  and  $s_L$  are the factor shares of capital and land and the result of the model in perfect competition conditions (where inputs are paid their marginal costs) is

$$\frac{d \ln R}{d \ln p} = \frac{\sigma + e_K}{\sigma + s_K e_L + s_L e_K}, \quad (4.3)$$

where  $e_K$  and  $e_L$  are the elasticities of capital and land, respectively (McDonald and Osuji, 1995). If  $e_L$  is assumed to be zero (as land value theory suggests) and  $e_K$  to be infinite, then the equation can be reduced to  $1/s_L$ . If the share on land in housing development is 20 percent, then land rent increases five times the amount of housing rent. But if  $e_K$  is less than infinity, also  $dlnR/dlnp$  can be less than  $1/s_L$ . The elasticity of supply of capital has a critical role in the increased housing rents impact on land values. (McDonald and Osuji, 1995)

In their paper McDonald and Osuji (1995) documented and measured empirically the effect of the construction the Midway Line on Chicago in 1993. The method used to evaluate the effect was the generalized before-and-after method for the evaluation of urban transportation improvements. After that the effects were also measured empirically.

The new transit line from the airport to downtown Chicago was built in 1993. McDonald and Osuji (1995) studied the impact of building the line on residential land values. They found that the impacts were seen as increased land values already in the year 1990. McDonald and Osuji (1995) estimated the changes in land value using Olcott (1950)'s Land Values Blue Book of Chicago and Suburbs and sampled 79 blocks within 3 miles from the line during the years 1980 and 1990. The distances to other important cites such as shopping streets, the center, a park or a school were also studied.

A generalized before-and-after method was used and a statistical model of the form

$$\ln V_b = \beta_0 + \beta_1 X_{1b} + \dots + \beta_n X_{nb} + \delta_b D + e_b \quad (4.4)$$

was created to model the effects before there was knowledge of the line. The variables from  $X_0$  to  $X_n$  all contribute to the value of land and are taken into consideration.  $\beta_0$  through  $\beta_n$  and  $\delta_b$  are coefficients and  $D$  is the distance to the (then future) stations and  $e_b$  is the error term. (McDonald and Osuji, 1995)

To model the effects of the line an equation for land values after the line was decided to be built was formed as an equation

$$\ln V_a = \alpha_0 + \alpha_1 X_{1a} + \dots + \alpha_n X_{na} + \delta_a D + e_a \quad (4.5)$$

,

where  $a$  means the values after the knowledge of the line.  $\alpha_0$  and  $\alpha_n$  are coefficients of after period and  $\delta_a$  the coefficient for distance to the stations.

The effect of the distance to transit stations was then measured as  $\delta_a - \delta_b$  and the

$$\ln V = 5,234 + 0,640T + 0,072D + 0,143DT \quad (4.6)$$

,

where  $T$  is a dummy variable for the year 1990 (equal 1 for 1990 and zero for 1980) and  $D$  is a dummy for location of one-half mile McDonald and Osuji (1995). The  $R^2$  of the model is 0,44 and the coefficient  $DT$  is  $\delta_a - \delta_b$  the before-and-after estimate of the transit line on residential land values McDonald and Osuji (1995). A 15,4 % increase could be attributed to close distance to the transit station sites, but the result was significant only in an 85 % interval with one-tail test (McDonald and Osuji, 1995).

The anticipated results in net increases of land values were 0,160 which is a 17,4% increase because of  $\ln(1+i) = 0,16$ , where  $i$  is the percentage increase. The estimate is close with the results from the simple before-after comparison.

Conclusion of the study was that residential land values of sites with distance up to one-half mile to the transit line stations rose 17% from what they would have been without transportation improvements in the area. The estimated improvement were 1,9% per mile of distance to Chicago downtown within the same one-half mile distance. (McDonald and Osuji, 1995)

## 4.2 Studies in North American, Australian and European cities

### 4.2.1 Pittsburgh

On their article Oates and Schwab (1997) study the tax reform in Pittsburgh in 1979-1980. The city was changing rapidly prior to the tax reform. It went from heavy manufacturing (almost 40 percent of employment in the metropolitan area in 1940) to light manufacturing and services (in 1985 only 16 percent constituted of heavy manufacturing) (Oates and Schwab, 1997).

The change from property taxation to land value taxation was part of a program called Renaissance II which together with other reforms aimed at urban renewal.

As Oates and Schwab (1997) put it, it is clearly impossible to disentangle fully the effects of all the various elements of the renewal effort. Their interpretation is, however supported by theory and evidence. According to their research, there was a huge building boom in Pittsburgh in late 1970s compared to other cities in the area. Although there was excess demand for office space and it clearly had an impact on new commercial building, only in Pittsburgh did commercial construction boom.

According to the study, the impact of land value taxation can be interpreted by viewing other public revenue alternatives. In other words its impacts can be seen when we compare it to other means of public revenue. If there would not have been a rise in land value taxation, the revenue would have been collected with some other means because during the 1970s there was fiscal pressure to balance the budget. In the article Oates and Schwab (1997) state that business location decisions are sensitive to levels on state and local taxes. It is then appropriate to assume, that higher levels of other taxes might have caused damage in the construction boom. The key lies in the neutrality of land value taxation - there is no adverse fiscal incentive such as there is with other forms of taxation.

The city of Pittsburgh, despite being often considered the application of best practice of land value taxation, has later rescinded the tax system due to lack of transparency, poor practice and misleading public perception of an unfair tax burden (Bourassa, 2009).

#### **4.2.2 Sydney**

The development land tax Doherty (2004) studied was levied to the developers of land that were re-zoned residential in Sydney. When the transport links and other infrastructure were built to those areas, the landowners could be argued to benefit as higher land values. This tax however puts residents living in an already-established suburbs in a better situation than new developers charged a tax (Doherty, 2004). The problem with levying a new tax is that it may cause the development in the area to slow in hope of the tax being turned down by the next government. This is what happened in the UK in the 1947, 1967 and 1976 (Doherty, 2004). The Labour party voted for the tax and the Conservatives against it causing it to fall every time. The speculation of Conservatives abolishing of the tax during the next government caused the development to slow (Doherty, 2004).

There is a clear argument against the development land taxation and it has to do

with equity. Even though the idea of taxing landowners who are going to gain from investments in infrastructure is fair, it puts the people who have developed land before the taxation in a more favourable situation than those developing it during the taxation. The answer to this problem with inequality could be a tax based on annual value increase.

Another way of resolving the problem would be to tax all land owners in the area regardless of the development time. The tax could be levied to a specific area only to capture the value increase caused by a government project such as developing new infrastructure. The charge should be based on the unimproved land leaving the value of buildings and other development out. The questions of who the tax is levied to and how much it would be still remain. The tax could be levied on all landowners in the city or metropolitan area or only to those located near the transport corridors who are expected to gain from the transport opportunity. A tax of different percentage for the two groups could also be considered. (Doherty, 2004)

### 4.2.3 Seattle

Gihring (2001) studied the value capture method in Seattle region. He simulated the use on land value tax as an alternative to conventional property tax and a land value gains tax within a half mile radius to a rail line.

In the study a model is introduced. The effects of a shift from jurisdiction's conventional property tax to a differential tax system can be examined by first finding the split rate that produces the same amount of revenue than before the switch. In the model a rate of 95% land value tax and 5% tax on improvements is used. Sites near the Broadway/John Street station are divided into two categories, fully utilized and under utilized based on assessment ratios and floor area threshold ratios. The fully utilized parcels experienced a 21% negative tax shift with differential land value taxation and the underused parcels a 93% positive shift. (Gihring, 2001)

Because the tax shift is high for the owners of underused parcels, an incentive to develop the parcel is created. If all the underused parcels in the model were developed to the same level as the fully used ones, a reduction of 30% in taxes would be experienced with the two-rate system compared to conventional property taxation. (Gihring, 2001)

Gihring (2001) also simulate value capture of windfall gains. Four classes of properties are studied during a twelve year period and land values near the station are

expected to rise at an annual rate of 14%, 8% being the historic rate in the region. Building values are expected to rise at the inflation rate 4%. Because the introduction of a land value tax causes the value to drop, the annual growth rate decreases to 9%.

The results can be seen on table 4.1. On all four categories the land value tax captures a larger amount of the value gains. (Gihring, 2001)

**Table 4.1** Cumulative land value gain captured by conventional and two-rate tax (Gihring, 2001)

		<b>Single family</b>	<b>Surface parking</b>	<b>Commercial non- redevelopable</b>	<b>Commercial redevelop- able</b>
<b>Full trend growth rate</b>					
Cumulative land value gain		\$293 930	\$628 259	\$1 030 452	\$1 058 052
Conventional tax		\$36 147	\$64 089	\$230 615	\$117 617
Gain captured (%)		12%	10%	22%	11%
<b>Declining trend growth rate</b>					
Cumulative land- value gain		\$213 902	\$457 203	\$749 891	\$769 977
Two-rate tax—95% LVT		\$56 977	\$134 335	\$211 267	\$203 712
Gain captured (%)		27%	29%	28%	26%

Gihring (2001) created also a simulation model for financing transit projects with Geo-bonds. Two assumptions are made based on prior studies such as Cervero (1994). First, the whole region's economy is growing and second, the government and investment programs support the activity.

A two-rate tax is levied where the rate is higher on land than on improvements. This allows the burden to shift from private investment capital and onto speculative value of real estate. Tax allocation bonds are issued. The term geo-bonds is used to describe the nature of the method, only the land rent is intended to capture, not the value on buildings. There are two possible scenarios to acquire the revenue. First

is capturing all the land value gains by a high enough land tax rate and second is capturing only the amount of gains that exceeds the general growth levels. (Gihring, 2001)

Gihring (2001) uses the same Broadway/John station area but now the model is dynamic. The same growth rates are used, 8% normal value increase and 14% increase in the area near the station and again the introduction of land value tax causes the growth rate to drop to 9%. The effects of using a land value tax are a larger percentage of land value increments can be captured than with a conventional property taxation. (Gihring, 2001)

Gihring (2001) concludes that with a two rate taxation the value created by the community would be captured rather than the value created by individual owners. Also an incentive to develop sites would be created. Gihring (2001) also concludes that market forces are the only mean of creating a high-density transit station communities through a catalyst and with creating an incentive these market forces can be guided.

One important influence to later research is the Knight and Trygg (1977) paper concerning the relationship of public transport investments and urban development. In the paper, six research question and answers are formed. The same topics have been studied by many researchers since and some of the answers have been confirmed in other papers.

The finding of the paper can be concluded as follows:

- Question 1: Is it possible that an urban public transport system promotes overall economic or population growth?
  - The first question was given an answer "no" in the paper and the same result has been confirmed in later research.
- Question 2: Is it possible that an urban public transport system increases densities and/or focuses development along certain corridors in a city?
  - The growth can be spatially channelled even if the overall growth is unaffected.
- Question 3: Which aspects of the area affect in a transport systems impact?
  - Four factor categories are identified in the paper; local land use policies, regional development trends, availability of land for development and the

station area's physical characters.

- Question 4: Do public transport technologies which differ have different impacts on development?
  - In the paper there is no clear answer to this question and it still remains unanswered due to the difficulty of examining the sole effect of public transport.
- Question 5: Can urban public transport systems lead to suburban growth or central business district growth?
  - In the paper, mainly central business district growth was recorded, if any.
- Question 6: How quickly is it possible to see development impacts of public transport?
  - Majority of the projects take several years to give measurable results.

(Knight and Trygg, 1977)

In Huang (1996) paper the research of urban rail transit system effects on real estate development in North America was reviewed. In the paper it was concluded that rail transit together with favourable zoning, attractive sites and strong market for development have influenced in urban development.

The interesting finding in Huang (1996) work has to do with the question 4: "Do different public transport technologies have different impacts on development?". Huang's result was that the effects light rail has on development depends on the same factors as does heavy rail systems.

#### **4.2.4 San Francisco**

Cervero and Landis (1997) studied the impacts of the BART system in San Francisco Bay area. The setting for public transport system was great in a densely built city with problems with traffic congestion. The results of the study however suggest that only minor effects on land development were seen. A possible reason discussed in the paper was the fact that BART system is region wide while land use control is done locally (Cervero and Landis, 1997). In other communities there had been interest and policies in place to support land development but in others there were not.

The impacts of public transport investments in European cities have been studied in the Gospodini (2005) paper quite comprehensively and the results are similar to the studies on North American cities.

#### **4.2.5 Copenhagen**

In Copenhagen, Denmark a new metro line was planned to be funded by selling off public land in Ørestad district, privatizing development and collecting more property tax revenue from rising land values (Knowles, 2012). In Copenhagen area, a transit oriented development plan called Finger Plan has been followed and the development of Ørestad district was a suitable enlargement of the plan. The purpose of the plan was to create transit oriented development of jobs, housing, retail, education and leisure activities.

However, this funding method later proved to be insufficient because the metro's overall construction problems caused the costs to increase (Knowles, 2012). From the estimated costs, the actual costs more than doubled making the original plan insufficient. Only a part of the metro line was in the end funded with value capture and the unexpected costs were later covered from overall tax revenue (Knowles, 2012).

### **4.3 Studies in Asian, South American and African cities**

#### **4.3.1 Hong Kong and Singapore**

What separates Asian cities from American and European ones is the high population and building density. The Chi-Man Hui et al. (2004) paper is a good example of value capture used in Asian cities.

Chi-Man Hui et al. (2004) analyzed the value capture mechanisms in Hong Kong and in Singapore. Both areas are very densely built and land is scarce. Both also have public leasehold systems in place to manage the land use but the land administration systems differ. The systems capture surplus land value and also enable management of urban growth due to reservation of land for public use (Chi-Man Hui et al., 2004). Land and property value capture form a large portion of public revenue in Hong Kong and Singapore and there are several mechanisms used in both areas.

Singaporean government owns 85% of the area's land and gives leases for industrial use (Chi-Man Hui et al., 2004). Another large use-group are residents, of which around 88% live in public housing flats (Chi-Man Hui et al., 2004). In Hong Kong, the state owns all of the land and natural resources. This particularly differentiates both Hong Kong and Singapore from American and European cities.

The leasehold systems mean that the governments have the possibility to develop land and obtain any value increments due to land development (Chi-Man Hui et al., 2004). Five factors are considered to affect the land values in these areas:

- Re-zoning.
- Changes in locational advantages as towns and cities expand.
- Improvements in public infrastructure and social services.
- The growth of urban population through migration and urbanization.
- Increases (or decreases) in private investments in land.

(Chi-Man Hui et al., 2004)

In Hong Kong, the government is said to uphold the principle that the gain should be returned to the community instead of subsidizing the developer and a 100% gain tax is used (Chi-Man Hui et al., 2004). In Singapore, the charge has been reduced to 50% to encourage development (Chi-Man Hui et al., 2004). Discounts on development charges are used in both areas to control development. Both Hong Kong's and Singapore's property taxes are based on market values making them equitable (Chi-Man Hui et al., 2004).

The tax administration systems of the areas on the other hand do have differences in efficiency making Singapore's one more efficient (Chi-Man Hui et al., 2004).

In Hong Kong, two kind of fixed annual taxes on real properties are in use and they are based on the rateable value of the landed property. Also in Singapore a property tax is levied and the tax is based on the annual value meaning annual rent. Both Hong Kong and Singapore also have a tax on rental income. To avoid speculation, Hong Kong uses a stamp duty payment. A payment is to be made at the time of purchase. Singapore, on the other hand has a three-year period after the purchase in which an income tax on the gains of the sale must be payed with the persons income tax rate. For the deceased, both Hong Kong and Singapore have a stamp duty and an estate duty. (Chi-Man Hui et al., 2004)

In Singapore, a development charge is levied on a development that is authorized by any planning or conservation permission. It is levied on the appreciation of land value, making it a betterment tax. It is a form of wealth distribution method. In Singapore also a differential premium, another charge, is levied for some site holders. Differential premium is a charge for the rights to for example use the land to a different purpose or extend the lease time. In Hong Kong, a lease modification premium is also used in situations of changed lease terms. The difference with these charges are that in Singapore, only 50% of the full market value is considered as a base for the charges as in Hong Kong a full 100% is considered. (Chi-Man Hui et al., 2004)

The total land revenue collected in Singapore and Hong Kong are of the same magnitude. It is a considerable part of the total government revenue. With the leasehold systems both governments can control the land use and the area's development quite comprehensively.

### **4.3.2 Tokyo**

Ito (1989) examined the New Joban Railway line in Tokyo and estimated the land values of properties in the area and calculated the increments due to the line. In the paper local taxes for the construction fund and the reduction of station construction costs and are discussed to ensure that the region would receive an adequate return for its investment.

### **4.3.3 Chile and Brazil**

Value capture methods have been discussed in Latin America already from the beginning of the twentieth century. In Chile, a law on "plusvalías" (land value increments) based on the ideas of Henry George was presented by the president in the 1930s. But despite the knowledge of value capture methods and ideology, it has barely been used in the continent. The legislation exists but it has not been implemented in many of the possible cities. The reasons for this are both the lack of understanding the possibilities and the lack of political will (Smolka and Furtado, 2001)

In spite of the problems in implementation, value capture methods have recently been used more often in Latin America. The need to face fiscal crises has caused the initiative to use value capture methods in the region.

In Brazil, Belo Horizonte and Porto Alegre transfer stations of their respective buss rapid transit systems, have been developed under accessibility increment contribution (Smolka and Furtado, 2002).

#### **4.3.4 South Africa**

Provision of municipal infrastructure in South Africa has a critical role in eradicating sociospatial inequalities and in overall poverty reduction strategy. South Africa faces a triple-challenge in infrastructure; eradicating infrastructure backlogs, maintaining existing infrastructure and providing new infrastructure at the same time. Brown-Luthango (2011) studies the possibilities of value capture methods to be used in South Africa.

Brown-Luthango (2011) states that infrastructure investment in South Africa is closely related to economic growth in the area. South African land market is highly unequal and the consequences of the Apartheid policy and legislation can still be clearly seen in South African cities (Brown-Luthango, 2011). Brown-Luthango (2011) uses betterment tax and special rating areas as an option to capture increases in land value of property parcels which have benefited from mass transit systems. Incentive zoning with medium-density residential units around transport infrastructure is another option discussed.

Compared to many other developing countries South Africa has a long history of collecting property taxes and a relatively well functioning administrative system (Brown-Luthango, 2011). To introduce a betterment tax, changes in legislation would be needed.

## 5. CONCLUSION

Land value taxation is a mean to earn revenue to local governments. It is in principle a tax on the unimproved value of land and thus creates an incentive to develop the land to a more profitable use.

The idea of land rents was first introduced already in the 18th century by Adam Smith. Henry George was later famously associated to land value taxation and the idea of communities creating land value. Land value tax has since been researched quite comprehensively and it is known for its efficiency. The reason for the efficiency has been known as land's fixed supply.

With economic theory, the effects of land value taxation can be examined. The relationship between land rents, land value and land value tax is quite simple and general and partial equilibrium effects can be calculated.

Important aspects of land value taxation are the length of the introduction period, whether the tax is based on the whole value of the parcel or only on value increment over some base value. Land value taxation might also be used with a two rate system, where there is a higher tax rate for the unimproved land and a lower rate for structures.

General equilibrium effects of introduction of a land value tax are found to be lower land prices. It can be concluded that the introduction causes a windfall loss for the existing landowners.

Neutrality of land value taxation has also been studied quite widely. The classical view is that it is neutral towards other commodity and factor prices. In some studies the results were in favor of this view but in some they suggested otherwise. The reason might be that in some studies the use of land was not allowed to change while in others it was.

Although economic theory suggests land value taxation to be efficient, there are some practical difficulties with it. The most commonly known difficulty has to do with assessment of land values. For property tax it is straight forward to use the

market prices but with land it might not be possible and other means of estimation must be found.

In comparison with property taxation land value taxation has the advantage of lack of distortion. Because property taxation is based on the value of buildings, a deadweight loss is related to it. On the other hand property taxation is more practical for the authorities.

Incidence of land value taxation can be studied with models and data from cities where it has been used. By comparing models which estimate the incidence of land value taxation the conclusion can be made that introduction of a land value tax have different effects depending on which kind of factors and sectors are included in the model and if they are mobile or immobile. Research questions regarding the distributional impacts on household level and fiscal effects were studied in more detail. The focus is in models which have been used to simulate and estimate the effects of land value taxation, in comparison of the effects of land value taxation with property taxation and case studies of land value taxation policies. It can be concluded that some policy decisions must be made when land taxation is applied. For some groups such as the already retired and agriculture the burden could be larger than to others if same rate would be applied. The taxation policies can be adjusted to fulfill the objectives wanted.

Areas with good transport opportunities tend to be valued higher than areas with poor opportunities. The impacts of large infrastructure projects such as building metro lines or new stations on land values near them have been reported comprehensively. Land value capture is a method used to fund public projects such as infrastructure investments. It can be divided into three categories, betterment tax, accessibility increment contribution and joint development. In all classes households or private markets take part in financing public investments.

If large infrastructure projects, which cause values of land around the transport opportunity to rise, are funded by the public sector, they are actually a transfer of wealth from all taxpayers to home- or landowners in the district in question. Taxing some of the increment of this added value would be called a betterment tax and it could be used to finance the infrastructure project. Accessibility increment contribution consists of fiscal incentive instruments which earmark future revenues to finance current expenses. In joint development on the other hand private and public investors work together to achieve investment large enough to fund an infrastructure project of mutual interest.

Some key notes from papers discussed in this study are the factors that influence the ability to use value capture mechanisms. In short they are:

- Increment of accessibility,
- Rate of overall growth in the area,
- availability of developable land,
- Zoning incentives and constraints.

Value capture methods have been used around the world and in some places they have worked better than in others. The cities have differed in terms of population densities, land regulation and land value assessment possibilities, which all have impact on the results of the studies made. As discussed on chapter 4, sometimes also the estimations of the construction costs might differ from actual costs causing the funding plans to be insufficient.

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