CHAPTER 5

GOVERNMENT INTERVENTION IN LAND MARKET: THE CASE OF TAXATION

Introduction:

Our analysis of urban fringe land market has so far proceeded on the assumption of non-interference by government authorities. We now relax this assumption. Government intervention in land market can take various forms as explained in Chapter 1. In this chapter we confine ourselves to only one of the instruments of government intervention, namely, taxation.

Taxation as applied to land generally varies over space either in terms of type of tax imposed or the rate of taxation which is levied. In the context of our study, we would be interested in two dimensions of these spatial differences namely jurisdiction and land use.

The fringe area as defined in our study lies outside the municipal jurisdiction and the land in this area, therefore, is not taxable by the municipal authority. Thus, for example, the fringe land (even when in urban use) escapes property taxation which land in urban area cannot. The fringe land, however, is liable to taxes levied by the rural authority (the panchayat), under whose tax jurisdiction it falls. Taxes
imposed upon a plot of land in the fringe area depend upon the type of use to which the land is put. Land in agricultural use is levied a land revenue tax and the land in residential use a house tax. The house tax, in essence, (except for the rate of taxation) is equivalent to property tax on residential use in urban area. The rate of house tax, however, is much lower than that of its equivalent in the urban area.

The taxes which vary between city area and fringe area are local in nature. Taxes which are imposed by Central Government will affect land (if they do) all over the country uniformly (unless special exemptions for some areas are made). They may however vary for lands in different uses. Capital gains tax is such a tax. It is imposed on gains made on sale, exchange or transfer of capital assets or rights in such assets. The tax, however, exempts agricultural land from its purview. Thus the farmer who sells his land without converting it into non-agricultural land (in popular language, without getting his land NA'd). We will be using the popular terminology in our study) will avoid the tax. The tax, however, will be payable by the seller (in our case farmer or speculator) of NA'd lands (in whichever jurisdiction they lie).

We select the three above mentioned taxes - land revenue, capital gains tax and the property tax (including its variant the house tax in rural areas) - to illustrate the impact of taxation on the behaviour pattern (specifically on the PV functions) of various operators in the market.
We start with the land revenue. Land revenue is levied on the agricultural land at a flat rate (per acre). The rate, however, is higher for more fertile lands. Thus, the tax differentiates between farms of varying fertilities but not between farms of different sizes. Further, land revenue is a recurring tax and it reduces the farmer's expected annual net returns from farming. Thus imposition of land revenue results in a downward parallel shift of MPV curve for land in agricultural use.\(^1\) The shift will be larger in case of more fertile lands. Thus the tax takes away some of the premium enjoyed by the more fertile lands. In terms of our PV curves it reduces - if not completely bridges the distance between the PVs for more and less fertile lands. The lowering of PV curves reduces the farmers' reservation price (which is equal to opportunity cost of land in agricultural use, i.e., PV of land in agricultural use). As a result the supply curve of land shifts to the right. The shift to the right is parallel in

\[\text{MPV}_{\text{agr.}}^{\text{without tax}} = \frac{d}{dz} \left[ \sum_{r=1}^{n} \left( \frac{R_r - C_r}{1 + t_r} \right) \right] \quad \ldots \ldots (1)\]

\[\text{MPV}_{\text{agr.}}^{\text{with tax}} = \frac{d}{dz} \left[ \sum_{r=1}^{n} \left( \frac{R_r - C_r - T_r}{1 + t_r} \right) \right] \quad \ldots \ldots (2)\]

where \(T_r = t_r Z\), \(t_r\) is the rate of tax (per acre) and \(Z\) is the size.

The difference between (1) and (2) will be

\[\frac{d}{dz} \cdot tZ = -t\]

which is a constant. Thus the shift in MPV will be downwards in a parallel fashion.
case the tax is levied at a flat rate and makes no distinction between lands of varying productivities. In case where the tax does make such a distinction and more fertile lands are taxed at a higher rate than the less fertile ones, the rightward shift in supply curve is accompanied by a change in its slope too. The after-tax supply curve becomes a flatter curve.²

The impact of capital gains tax on the supply price of the farmer is just the opposite of that of a land revenue tax.³ The tax reduces the after-sales returns of the farmer. The farmer will take this into account while fixing the reservation price for his plot of land. The reservation price would be increased by the amount of the tax so as to leave the net amount of money which remains with the farmer after payment of

²This follows from the discriminatory impact of higher taxation on more fertile lands, which results in a higher (compared to pre-tax situation) increase in supply of land for the same change (increase) in price. If taxation wipes out all the difference in revenue due to fertility and size the supply curve will become a horizontal straight-line.

³Here we are assuming that the farmer gets the land NA'd and hence is liable to pay the capital gains tax. In case he sells the land as agricultural land the tax would have no impact on his supply price.
the tax equal to the opportunity cost of land in agriculture. Capital gains tax, thus, shifts the supply curve to the left. The shift is parallel in case of a proportional (capital gains) tax. A progressive capital gains tax, on the other hand, results in a steeper supply curve.

The effect of capital gains tax on the behaviour of speculator is not that straightforward. The speculator's demand and supply functions are interlinked. The speculator buys land only to resell it later on. The imposition of capital gains tax reduces his demand for land. The revised (post-tax) demand curve is a lower and a steeper curve. The

\[ NPV = \frac{S_n}{(1 + i)^n} - P_o \]

After imposition of tax it reduces to

\[ NPV = \frac{S_n - T_{CG}}{(1 + i)^n} - P_o \]

where \( T_{CG} = t_{CG} (S_n - P_o) \), \( t_{CG} \) is the rate of the capital gains tax.

Thus for a given \( P_o \) and \( P_n \) as the size of land increases the amount of tax payable increases too. Thus as the size increases NPV will decline by a larger and larger amount. The decline in NPV (over size) will be even larger with a progressive capital gains tax. The speculator's point of maximum profit will move to left of pre-tax position and he will invest less land than before.
impact of a price change on speculative demand for land is felt through its (price's) impact on the speculator's NPV function. The inclusion of capital gains tax in the system modifies this impact. The price now affects NPV in two diverse directions. This can be explained better as follows:

The speculator's NPV function is defined as:

\[
NPV = \frac{S_n}{(1 + i)^n} - P_0
\]

and after the introduction of tax, as

\[
NPV = \frac{S_n - t_{CG}}{(1 + i)^n} - P_0
\]

or

\[
\frac{S_n - t_{CG}}{(1 + i)^n} (S_n - P_0) - P_0
\]

where \( t_{CG} \) is the rate of capital gains taxation.

As the current price of land declines (say) both the factors on the RHS of eq. (3) decline. \( P_0 (= P_0 Z_i) \) declines and leads to an increase in NPV. The increase in NPV is dampened by the impact of a change in \( P_0 \) on \( S_n - T_{CG} \).

\( S_n - T_{CG} \) decreases with a decline in \( P_0 \) and thus reduces the impact of a price change on NPV, and hence on demand for land.5

5The net impact of a price decline on NPV will depend upon the rate at which both factors on RHS decline. In the above we assume that decline in first factor is lower than that in the second but it is quite possible to conceive of a situation where the decline in NPV due to increased tax liability (due to a decline in current prices) will offset the increase in NPV and reverse the impact of a price decrease on quantity demanded of land.
Consequently, we get a steeper demand curve for land. Further more progressive the capital gains tax, more steeper (and lower) will be the speculator’s demand curve for land.\(^6\)

Finally, we come to the property tax. The property tax (or house tax) will have direct impact on the buyer of land who intends to use the land for residential purposes. While planning to buy the land, the consumer would calculate the PV of land for urban use taking into account the property tax \((t^D)\). He will treat the tax as a recurring cost and amortize it over the lifetime of residential use of land.\(^7\) The NPV

\(^6\)Since a progressive rate of taxation would imply even a sharper decline in \(Sn - T^D\) (with a decline in price) leading to an even smaller increase in NPV.

\(^7\)We are implicitly assuming that the buyer has to bear the full burden of the tax and that he cannot shift it backward or forward. In case the buyer plans to rent out the residential building and pass on the tax partially or fully to the tenant, the shifted part of the tax will not be amortized by him. The possibility of shifting forward (to the tenant) or backward (to the farmer) depends on the elasticity of demand for residential accommodation (by tenants) and elasticity of supply of land of the farmer respectively. In case the supply of land is inelastic, whole of the burden can be passed on to the farmer. This, however, is not the situation in our case. The farmer’s supply of land is elastic with respect to price. Again, the tenant’s demand for accommodation also, most probably, cannot be fully inelastic and the buyer will not be able to shift whole of his tax on to the others. In case he can, the tax would have no impact on his purchase plan.
of land in urban use (for any sized plot) will shift down. This follows directly from the consumer's revised NPV function:

\[
\text{NPV} = \left\{ \frac{R_1-C_1-t_P}{1+i} + \frac{R_2-C_2-t_P}{(1+i)^2} + \ldots + \frac{R_n-C_n-t_P}{(1+i)^n} \right\} - P_0
\]

The consumer's equilibrium point on the post-tax NPV curve will be to the left of the original curve. Thus property tax would lead to a decline in demand for land. More progressive the tax, greater will be the downward shift of NPV curve as size increases and lower the demand for land. Thus, more progressive the property tax, the steeper will be the demand curve for land.

Imposition of property tax will not affect the farmer's supply curve for land since it is not levied on agricultural use of land. The speculator's behaviour pattern, however, will be influenced, albeit indirectly by this tax. The speculator's demand for land depends upon expected future demand for land of consumers. A decline in that demand (as a result of imposition of property tax) reduces speculator's expected returns and hence his demand for land.

---

This is due to the fact that the downward shift in NPV curve is accompanied by change in the slope of the curve such that it is flatter on the upward rising portion and steeper on the falling portion of the curve. (In simple language the distance between the curves increases over size). The highest point (which is the consumer's equilibrium point) of the shifted curve, therefore, lies to the left of the original curve. This will be true for a proportional as well as a progressive property tax - though the shift will be sharper in case of the progressive tax.
There are some other variants of property tax which have a direct impact on the speculator's behaviour. These are land value tax or vacant land tax which increase the speculator's holding cost, lower his profits and reduce his demand for land.

In the above discussion, we have analysed the impact of taxation in isolation. Sometimes imposition of a tax is accompanied by provision of certain services and facilities which get capitalised and lead to an increase in FV of land. Thus, the provision of services does off set, to some extent, the negative impact of taxation on FV of land. However, taxation may not be accompanied by the provision of services. Except in case of taxes like 'betterment levies' there is no quid-pro-quo to taxation. Again so long as the act of taxation does not lead to an increase in provision of services we are quite justified in analysing the impact of taxation, by itself. Further, our objective in this study is to analyse the impact of various taxes (none of which belongs to the family of betterment levies) on the land market operations in fringe areas. The analysis of impact of taxation in isolation, in view of the above objective brings the issues in sharper focus. In the following paragraphs we proceed to analyse the impact of taxation on the process of

---

9If FV is increased due to better services or other exogenous factors, etc. we study the impact of taxation on this increased FV. We are only interested in finding as to how different taxes will affect the market operations.
price determination and land-use allocation in a system of
dynamic and interdependent land markets. Our method of
analysis will be the same as was used in Chapter 4.

Impact of Taxation – A Dynamic Analysis

We start with the description of a system as it exists
in the beginning of Period 0. The system of interdependent
land markets has been divided, as explained before, into
various homogeneous submarkets for land. The city area
had been identified, in our study, as ring 1 and the fringe
area has been divided into rings 2, 3 and 4. Property
taxes are levied on the use (residential, commercial, indus-
trial, etc.) of land in urban area (ring 1). A house tax,
at a very nominal rate is levied on the residential use of
land in the fringe area (rings 2, 3 and 4). Land in agri-
cultural use is taxed at a flat rate per acre. A capital
gains tax is imposed on the sale or transfer of non-agricultural
The rates of relevant taxes are the same for all the rings in the fringe area.

We make the assumption here that the farmer and speculator both sell the land after getting NA permission and therefore are liable to pay capital gains taxes. We further assume that getting NA permission is a costless operation. If not so, the supplier will include the cost (of NA) in his calculation of reservation price. In case the cost of NA is shifted on to the consumer, the consumer would take account of this cost in calculation of his PV for land while planning to buy.

It is not only the fact of existence of a tax that changes the PV of land, expectation of imposition of a tax would also affect PV. The effect, however, will not be the same in the two cases. The difference will be a function of timing at which the tax is expected to be imposed as also the certainty with which it is expected to be imposed. Another variable in this function is the expected rate of taxation and the uncertainties attached to that. The impact of actual versus expected taxation on value of PV would be the same if the operator expected, with full certainty, the imposition of the tax the moment he enters the market. That however, seldom happens. The operator might expect the tax to be levied 5 or 10 years after he enters the market for purchase or sale of land. In case of sale the impact of a tax (say capital gains tax) expected to be levied 5-10 years (or for that matter even a day) after he plans to sell will be nil. In case of purchase of land by the genuine consumer, levying of a tax 10 years from the time of his purchase will still affect his PV for land. The decline in PV however will be much lower than if the tax existed at the time he purchased land.

Different consumers will have different expectation regarding timing and rate of taxation. This coupled with different certainties with which they expect will make analysis of impact of individual behaviour on market behaviour a bit complicated.
Land Market in Period 0

Taxation and Supply of Land:

These taxes will now enter (as inputs in) the decision-making process of the various operators in the land market. In Period 0, we have only the farmer (as supplier) and speculator (as buyer) in the land market.

The farmer's supply curve, in Period 0 is based, entirely upon the opportunity cost of land in agricultural use. His reservation price would take account both of land revenue and the capital gains tax. The two taxes have opposing effects on the supply for land. The net effect of the two taxes is a question of empirical judgement and would depend on the rate of the two taxes.

Taxation and Demand for Land:

The speculator's demand function based on expectations, now takes on another dimension. His demand for land in Period 0 is a function not only of expectations regarding future prices but also of expectations regarding taxation. The speculator is quite aware of the existing structure of taxation in the various rings. He, however, does not expect the structure to remain the same over time. He anticipates incorporation of fringe areas into the municipal area at some future date.\[11\] His plans for future

\[11\]The incorporation of fringe area into the municipal area depends upon various political and economic factors like growth of urban population in the area, density of the area, etc.
(including for Period 0) would consider the impact, in terms of taxation, of such an incorporation. Thus, in his decision making process, the speculator will explicitly include the possibility of imposition of a property tax in the fringe area in future.\textsuperscript{12} The speculator does not expect incorporation of whole of the fringe area into the urban area, at the same time. He expects ring 2 to be the first one to be incorporated. Rings 3 and 4 he expects would follow subsequently. His NPV curves for various rings will reflect the impact of expected taxation. The expected taxation dampens the speculator's expectation regarding future urban demand for land. The effect is felt more severely on demand for land in rings which are expected to be incorporated earlier than the others. Thus, the NPV curve for ring 2 will shift down more sharply than that of ring 3 and the downward shift for ring 3 NPV will be larger than that for NPV of ring 4. The speculator, in view of the new situation

\textsuperscript{12}The speculator's decision making process, to be precise, will not be affected directly by his expectation about imposition of property tax but by his expectation regarding consumer's expectations about future. (This is because, as mentioned before, property tax does not affect speculator's NPV function directly). Thus, in the text above we are making an implicit assumption in this respect. Specifically, we are assuming that the speculator expects the consumer to be aware of the possibility of the imposition of the property tax. He also expects the reflection of this 'awareness' on the part of the consumer in his (consumer's) NPV function. The impact on speculator's demand function (of expected property tax) is directly dependent upon the anticipated effect of expected property tax on consumer's demand function. Thus, in the text wherever we mention speculator's expectation regarding property tax, we imply speculator's expectation regarding consumer's expectations about the property tax. We use the former terminology to avoid use of cumbersome language.
may decide to buy land in ring 3 or 4. If, however, the expected rate of growth of prices in ring 2, despite imminent threat of taxation, continues to be higher than that of rings 3 and 4, he will still decide to buy in ring 2. This possibility (of his buying in ring 2) diminishes with increasing rate of taxation and nearing of time of incorporation. The speculator may even decide not to purchase at all in Period 0. This postponement, however, will be due to considerations other than expectations regarding property tax. The property tax gets amortised in the capital value of land and the speculator cannot escape the impact (howsoever indirect it might be) of the tax by postponing his purchase. ¹³

In the beginning of Period 0 the speculator would also plan for future resale and purchases. His plan for future resale will take account of the expected cuts made in net returns

¹³Speculator's NPV function if he purchases in Period 0 will be:

\[
\text{NPV} = \frac{S_n}{(1+i)^n} - P_0
\]

If he decides to purchase in Period 1, his NPV function (his sale period remaining the same) would be:

\[
\text{NPV} = \frac{S_n}{(1+i)^n} - \frac{P_1}{(1+i)}
\]

He will postpone if \( P_1/(1+i) > P_0 \). The difference between \( P_1/(1+i) \) and \( P_0 \) is not attributable to expectations regarding property tax.
due to capital gains tax.\textsuperscript{14}

Thus, both the farmer and speculator will make plans for Period 0. These plans will be implemented during the period i.e. purchases and sales will be made at prices arrived at as a result of interaction of forces of supply and demand. The demand for land will be lower as a result of taxation. We can't say anything definite about the supply curve.\textsuperscript{15}

\textsuperscript{14}We here assume that the speculator expects the capital gains tax to continue for ever (so to say). He might expect, under certain circumstances removal of the tax. His quantum of purchase and timing of resale will be influenced by such an expectation. Generalising, we could include, in our analysis, the possibility of removal of some taxes (rather than imposition of new taxes alone) in the operators' expectation function. Examples could be cited of taxes like land conversion tax or speculation tax which the operator might expect to be removed due to political pressure or economic factors like low receipts, etc.

\textsuperscript{15}Our inability to say anything definite about the supply curve and consequently about price and amount transacted stems from inclusion of taxes with offsetting effects. Now, if we were to take only the land revenue tax on the agricultural use and property tax on urban use we could come to definite conclusions regarding price determination and land use allocation in the market. The supply curve would shift down and so would the demand for land. The price will decline. The change in quantity transacted would depend upon the relative rates of decline of supply and demand curves. The quantity transacted will decline if the shift in demand curve is sharper and vice-versa. Further, considering land revenue alone (in isolation) we can say that (ceteris paribus) it lowers supply, leads to a decline in price and an increase in the quantity of land which goes for speculative use in Period 0. Similarly, property tax (or expectation thereof) reduces demand for land, lowers prices and leads to a decline in the amount of land transacted. A capital gains tax affects both demand and supply of land – it reduces demand and shifts up the supply curve. Its effect on price is indeterminate (though empirically determinate) but quite determinate with regard to amount transacted. The amount transacted declines.
prices which emerge as a result may be different from the expected prices. The difference will lead to revision of expectations. Exogenous factors like political climate and other occurrences in Period 0 would also influence revision of expectations. Plans for Period 1 and future periods will be made on the basis of these revised expectations.

Land Market in Period 1:

Supply of Land and Taxation:

In Period 1, the farmer is still the largest holder of land in fringe area. The occurrences in Period 0 broaden the vision (or mental horizon) of the farmer and change the basis of his reservation price. He no longer thinks in terms of sale but in terms of sale now (Period 1) or in future. The farmer's decision rule in Period 1 has been explained in the last chapter. Imposition of tax would modify this rule.

Assuming a planning horizon of \( r \) periods, the farmer would decide to sell in Period 1 if the following two conditions are met:

\[
(1) \quad P_1 \geq PV \text{ agricultural use} + T_1^{CG}
\]

or

\[
(2) \quad P_1 - T_1^{CG} \geq PV \text{ agricultural use}
\]

\[
(11) \quad P_1 - T_1^{CG} > \frac{P_2 - T_2^{CG}}{(1+i)^2} + R_1 - C_1 - t_1
\]

\[
P_2 - T_2^{CG} > \frac{P_3 - T_3^{CG}}{(1+i)^2} + \frac{R_2 - C_2 - t_2}{(1+i)} + R_1 - C_1 - t_1
\]
\[ P_1 - T_1^{CG} > \frac{P_r - T_r^{CG} + R_r - c_r - t_r^L}{(1+i)^{r-1}} + \cdots + R_1 - c_1 - t_1^L \]

where \( T_1^{CG}, T_2^{CG}, \ldots, T_r^{CG} \) are the (expected) amounts payable on account of capital gains tax, \( t_1^L, t_2^L, \ldots, t_r^L \) is the land revenue tax, \( P_1, P_2 \) are the (expected) market values of land (for a given size). Subscripts 1, 2, \( \ldots, r \) refer to time periods.

First condition implies that the farmer would be willing to sell if the market price is greater than or equal to the reservation price. The reservation price now includes the amount which the farmer has to pay as capital gains tax. The second condition explains the dynamics of the situation. The farmer would plan to supply in Period 1 if and only if by doing so he makes larger profit than by selling in any other period. He compares the pros and cons of selling in Period 1 versus selling in Period 2, or Period 3 or \( \ldots \), Period \( r \) etc. The farmer would also tentatively consider the relative advantage of selling in Period 2 versus Period 3 and so on. On the basis of the above exercise he decides the period of his sale.

A land revenue tax will reduce the farmer's supply price (reservation price) and may lead to preponement of his decision.
to sell. A capital gains tax (CGT) will have the opposite effect on reservation price but its effect on timing of sale will be same as that of the land revenue tax. As explained earlier, the farmer expects the land values to increase over time. CGT, which is a fixed (in case of proportional CGT) or an increasing (in case of a progressive tax) ratio of land value, increases too. The farmer would compare, the (discounted value of) expected increase in price with the (discounted value of) expected increase in tax liability, to come to a decision regarding the timing of his sale. He would postpone to sell if and only if the expected rise in future price is high enough to offset the increased tax liability on CGT account. Thus, the farmer would sell earlier than he would have sold in the pre-tax situation. The incentive to sell earlier will increase (other things i.e. rate of growth of prices remaining the same) with progressively increasing rate of CGT.

Farmer's supply schedule for land for Period 1 (and for future periods) is derived on the basis of the above exercise.

---

16 This is compared to pre-tax situation. The net returns from agriculture are lower. The incentive to keep land in agricultural use is thus reduced.
The second part of supply of land comes from speculators. The speculator, in the beginning of Period 0 had made certain plans for purchase (and resale) of land in Period 0, and in future periods based on expectations. At the end of Period 0 he would review his decision and revise his expectations regarding future and plan for Period 1 on the basis of these changed expectations. His expectations regarding the timing of taxation in various rings may be now revised on the basis of certain exogenous factors like political climate or growth of population/density, etc., in various rings in Period 0. These factors may prepone or postpone the expected incorporation of various rings into the municipal area. The speculator will revise his plans accordingly. In Period 0 he might have decided to sell his land in Period 1. His decision to sell in Period 1 or later will be guided by rules discussed earlier (Chapter 4). The imposition of taxation, however, introduces another element into the picture. While deciding the timing of sale the speculator would consider, among other things, the amount of tax liability at each period of time. The value of land and the tax liability (on CGT account) increase simultaneously. The speculator will postpone sale if and only if (other things remaining the same) the expected increment in future value of land compensates for increment in tax liability. Thus, CGT (at a sufficiently high rate) can induce the speculator to sell earlier than he would in the no-tax situation.
Speculator in Period 1 is in the market not as a supplier alone but as a buyer too. His demand function has been analysed above. Changed expectations will change his plans for Period 1 and future periods regarding location, quantum and time of purchase. To his demand we add the consumer's demand for land to get aggregate demand.

The consumer enters the fringe land market for the first time in Period 1. His decision to purchase has three dimensions - (i) quantity of land to be purchased, (ii) location of purchase and (iii) timing of purchase. The three decisions are made simultaneously. We have already explained the mechanics of this decision making. Here we will analyse the modification made (to this decision) by imposition of taxation.

The consumer takes into account not only the existing house tax which will increase his annual recurring cost (and reduce NPV) but also the expected increase in this tax when the fringe area gets incorporated into the municipal area. The consumer has expectations regarding the timing of incorporation (and its synonymous imposition of the higher tax) of the fringe area. His expectations regarding the timing of incorporation are different for the various rings. He expects ring 2 to be the first one to enter the municipal jurisdiction, ring 3 he expects would follow ring 2 at a much later period and ring 4 is expected to be the last entrant. The existing and expected taxes will affect consumer’s NPV curves for the various rings. His NPV curve for ring 1 will shift downward consequent to the imposition of property tax. So will be the NPV curves for the
other rings. The downward shift will however be much less sharp in case of rings 2, 3 and 4 as compared to shift for ring 1. This is due to the fact that the higher property tax is expected to be levied in rings 2, 3 and 4 at a later date whereas in ring 1 it is already in existence. Again, further into future the expectation of the higher tax, lower will be the decline in NPV. This is so because the future (expected) tax liability gets discounted and farther into future is the expectation of the tax lower will be present value of the (amortized) tax. Thus, NPV for ring 3 will shift downwards less sharply than that for ring 2 and for ring 4 the shift will be even less (than that for ring 3). The consumer will make his decision regarding purchase of land on the basis of the new NPV curves. The lower price of land in far off rings coupled with low taxation rates at present and the distant future possibility of high taxes may push the consumer even farther into the fringe, leading to accentuation of the problem of sprawl. If the incorporation of ring 2 into

As explained in Chapter 3, the consumer's choice regarding location of his purchase is made on the basis of comparison between NPV's in various rings. The consumer chooses to buy land in the ring denoted by the highest NPV curve. Imposition (or expectation there-of) of taxes changes the relative position of the different curves. A higher existing or imminently expected higher tax (in a ring) leads to a sharper decline in NPV of that ring as compared to NPV of rings with low existing taxes or low expected taxes or high expected tax but expectation of imposition of which extends very far into future. Thus, according to our analysis above, the decline in NPV curve for ring 1 will be the largest and for ring 4 the smallest. This shifting of NPV's for various rings may so change the relative position of these curves that NPV for ring 3 (or for ring 4) may be highest in the consumer's preference map and he may decide to buy land in ring 3 (or 4).
municipal jurisdiction is imminent the consumer may opt to buy in ring 3 or 4. The imminency of incorporation of ring 2 may tilt the balance for some marginal consumer in favour of ring 1 too. The choice of location will depend upon the financial status of the buyer and above all on relative prices and taxes in various rings.

The third dimension of the choice problem of the consumer is timing of purchase. This has been discussed in detail in Chapter 4. Introduction of taxation in the system modifies the decision rule slightly. The consumer would opt to buy in Period 1 rather than in Period 2 if:

\[
\frac{P_2}{(1 + r)} - P_1 > K_1 - R_1 - C_1 - t \frac{P}{1 + r}
\]

where \( P_2 \) and \( P_1 \) are the values of land in Period 2 and Period 1 respectively. \((R_1 - C_1)\) are the net returns from residential use.

\[\text{18. The shape and position of NPV curve, in our analysis, incorporates information regarding land prices, returns from a given land use and impact of net borrowing. Thus, relative positioning of various NPV's (of different rings) will depend upon these factors. Given these factors, however, the imposition of tax will change the position in favour of low taxed (existing or expected) areas. The change (in relative positioning) however, may or may not be big enough to shift their NPV curves above the NPV curves of other (high taxed) rings which score on a count of relative returns.}\]
of land in Period 1 and \( t^P_1 \) is the amount payable on account of existing or expected (if it is expected to be levied in Period 1) property tax. \( K_1 \) is the return on alternative investment. Subscripts 1 and 2 refer to time periods. \( i \) is the rate of discount. Generalising the rule

\[
\frac{P_r}{(1+i)^{r-1}} - P_1 \left\{ K_1 + \frac{K_2}{(1+i)} + \ldots + \frac{K_r}{(1+i)^{r-1}} \right\} = \\
\left\{ R_1 - C_1 - t^P_1 + \frac{R_2 - C_2 - t^P_2}{(1+i)^2} + \ldots + \frac{R_r - C_r - t^P_r}{(1+i)^{r-1}} \right\}
\]

where \( r \) refers to the time period 1, 2, 3, \ldots \( r \).

Thus the consumer would plan to purchase land in period 1 (in preference over Period 2 or 3 or \ldots), if the expected increase in price in that period is greater than the net returns (calculated by deducting the loss of returns from house if he does not buy in Period 1 from the returns on some alternative investment) he expects to earn by postponing the decision.\(^{19}\)

The modification in decision rule, as we note, is in the second factor on the right hand side which now includes the tax.

\(^{19}\)The rule has been explained in detail in Chapter 4. We therefore will not elaborate on it any more.
factor $t^p$. The lowering of net returns from residential use of land due to imposition of tax increases the incentive to postpone the purchase. The higher the property tax, greater the incentive to postpone. 20

We get the consumer's demand for land for Period 1 on the basis of the above exercise. Adding to it the speculator's demand for land we get our aggregate demand for land. The intersection of the forces of demand and supply determines the price in the market.

As is clear from the above analysis the taxation reduces the demand (both speculative and that of the consumer) for land. It also affects the supply of land (the direction of influence depending upon the relative impact of land revenue and capital gains tax which have opposing effect on supply curve). Further it induces both farmer and the speculator to sell in the present period rather than to postpone the sale to some future period. On the other hand, the current demand for land declines as a result of postponement to future. The combined impact of all these forces is to reduce the price in the land market. The transactions will take place at these prides arrived as a result of interaction of forces of supply and demand.

20We assume that taxation has no impact on rents and on rate of discount.
At the end of Period 1 the operators would review the situation, revise their expectation on the basis of past experience and other exogenous factors and plan for Period 2 on the basis of these revised expectations.

Conclusion:
In this chapter, we have attempted to analyse within the framework of our model, the impact of different taxes on various aspects of operation of land market. The different taxes, in combination may have off-setting influences, thus making it difficult for us to pinpoint the exact impact on price or demand and supply. The above analysis, however, does point out the individual impact of the three taxes discussed on demand, supply and prices. It also brings out the impact of each of the taxes on the dynamic processes of land market in terms of time of purchase and sale when the planning horizon extends over many periods. This has implications for the speed at which the agricultural land gets converted into an urban area. Further, the impact of various taxes on speculation (speculative demand and resale) and sprawl has also been analysed.