

BUILDING ECONOMICS
INTENSITY OF LAND DEVELOPMENT

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PRIMARY SOURCE:

Harvey, J. *Urban Land Economics*, Macmillan, 3rd edn, 1992, pp. 93-98, 104-107.

THE INTENSITY OF SITE USE (DIAGRAM)

In practice, the two decisions — most profitable use and the capital-intensity of development — are arrived at simultaneously.

- We can simplify the analysis of determining the capital intensity of a site by assuming that the best use has already been determined.
- We are dealing with a particular site so land is a fixed factor.
- We start by assuming the project has a life of one year and all returns are received at the end of the first year. An example would be a non-renewable one-year lease held on a vacant site.
- The problem now becomes one of applying the variable factor of capital to a fixed factor of land.
- We assume that all costs of developing the site are capital costs.
- These cost of include material and labour cost, ripening and waiting costs, legal fees, and normal profit.

Ripening costs arise through holding land in anticipation of profitable future development, that is, interest foregone on capital tied up plus speculative element of paying over and above the current use.

Waiting costs include professional fees and interest on stage payments. Waiting costs are paid out of the developer's own pocket hence why there is undue haste in completing projects.

- We define \$100 as being a unit of capital that is applied to the land.
- We assume there is perfect competition in the capital and property market. Developers can obtain all the capital they require at a given price.
- The total cost for one unit of capital for the year is \$100 plus the going rate of interest.

The marginal physical product is the additional net lettable floor area created by employing one additional unit of capital.

- The resulting product sells at a given price.
- Price is always in dollars per unit, in this case dollars per square metre of net lettable floor area.

The marginal physical product can be regarded as the marginal revenue product that excludes operating costs.

- Assume that each office floor lets at the same rent, regardless of height of floor space.
- Assume there are no local authority controls on height and developers are free to bid for the site.

As extra units of capital are applied to a site, the law of diminishing returns comes into operation.

- As the height of the building increase, the net lettable floor area decreases due to the need for larger columns at the lower floor levels, more banks of lifts, and increasing duct sizes for services.
- The marginal physical product of capital falls.

- The returns of given additions to capital decrease.
- The marginal revenue product curve is therefore downward sloping.
- As we have assumed there is perfect competition, the marginal costs, or total costs per unit of capital, remains constant regardless of the amount of capital employed.

Development of the site will take place up to the point where marginal revenue equals marginal costs.

- At this point OB the marginal revenue product of a unit of capital equals the cost of a unit of capital.
- The building reaches its optimum height when OM units of capital have been applied to the site.
- The total net revenue of the development will be the area AOMC, and the total capital cost is the area BOMC.
- The maximum which the developer can pay for the land, and still retain a normal profit, is the residual shaded area ABC.
- If offices were the only or best use to which the site could be put, the area ABC would represent the demand price for the site.
- Competition among developers would ensure that this demand price would in fact be bid.
- The shaded area ABC represents economic rent and is the value of the site in its highest and best use.

Relaxation of the one-year-life-project assumption

- We can now relax the initial assumption that the project has a life of one year.
- The above solution still holds provided we assume that the price of capital and the price of the product do not change over time.
- Yields can be discounted back to their present value in the year they are obtained and then added together.
- The area AOMC now represents the value of the aggregated discounted yields throughout the estimated life of the project.

The effect of a change in productivity (diagram)

A higher building and a higher site price will result from a rise in the marginal revenue product of capital.

- A rise in the marginal revenue product of capital can arise through an increase in the marginal physical product as a result of:
 1. increased productivity of the building industry;
 2. higher revenue from increased prices of the existing product supplied by the building;
 3. a new higher use as the demand for another good increases.
- If there is an alternative use for the site which enables greater productivity, in other words the marginal revenue product is greater for each unit of capital employed, then there would be a larger residual surplus as shown by the higher MRP' curve.
- The developer who recognised this use would bid more for the site.

Competition ensures that a site goes to its most profitable use for this has the largest residual surplus.

- Competition also ensures that a site is developed upwards to the point where marginal revenue equals marginal costs where the bid for the site is a maximum.
- The building on the site is the one that secures the highest possible yield.

The effect of a fall in the rate of interest (same diagram)

A higher building and a higher site price will result a fall in the rate of interest.

- A fall in the rate of interest would lower the cost of each capital unit from O_i to O_i' .
- The height of the building would increase from OM to OM' using the same marginal revenue product curve MRP .
- The price of the site would rise from A_iC to $A_i'C'$ when the marginal revenue product MRP rises to MRP' or from A_iC to $A_i'C''$ when the rate of interest falls to O_i' .

From the viewpoint of an individual developer

High land prices cause high buildings.

- Land is a cost and the developer has to pay the competitive market price in order to obtain it.
- The higher the price of land, the more the developer has to economise its use. A site has to be used more intensively by applying more capital per square metre of land.

From the viewpoint of the land market as a whole

Because high building is profitable, land values are likely to be high.

- Where demand is high, the use capacity of land is high.
- This means that a highly intensive use of land is profitable.

The extensive use of land (diagram)

The developer will only build an extra storey so long as this is cheaper than acquiring extra land.

- By building higher, the developer is in effect saving on the cost of land.
- Competition for land for different uses will ensure that, in the long run, development everywhere will be pushed to the point where the marginal return to capital is equal to the marginal cost of capital for every site.
- Plots of land of the same size in the city centre and the suburbs are developed by the addition of capital OM_a and OM_b respectively.
- The rent for the city centre site is ABC and the rent for the suburban site is $A'B'C'$ respectively.