



Assignment 01

a) There are several factors that affects a firm' to decide where to locate within a city.

* The transportation cost.

Firms have to transport their products to the city center as well as their required materials from city to their factories. Firm's transportation cost is high when we compare it with worker's commuting cost. And also firm's value for time is more important than workers. Thus if firm located away from the city center, they have to pay higher transportation cost.

* Quantity produced per unit of land.

If a firm produce larger quantity per unit of land, then they require small amount of land. So in the city center the rents for land is high due to low transportation costs etc. So if a firm produce large no. of quantity per unit of land they can locate in the city center. For example offices, of certain firms & service sector firms.

* Proximity to materials and other infrastructure.

Other than the transportation cost, the proximity to reach/transport materials & to get easy of required infrastructure is also a factor which decides where to locate in the city.



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* Proximity to workers.

Another factor to consider in this decision is about the easy for workers to reach the firm. If workers / households are located far away from the firm they have to pay higher wages compensate for the workers for their commuting cost. So firm can decide upon the distance for workers to reach the firm.

* Government regulations - environment protection.

Another factor to consider when selecting a location is government regulations for instance environment protection regulations. Some firms / factories which usually generates some ~~at~~ noise, polluted air etc. should undergo with the environmental protection laws & they have to locate far away from the residential areas.

* Tax incentives & Industrial zones.

Some municipalities provides certain areas which encourage firms to locate in such zones with all provided infrastructure. If such firm finds a place like those industrial zones, they will locate in those areas to get those provided benefits.



b) In this monocentric city model, where there are different types of X profit maximizing firms operate within a perfect competition economy, there are few assumptions to consider.

- It is assumed one central business center & the city is circular.
- All firms are identical & use same production process \Rightarrow technology.
- All firms produce certain amount of production.
- All firms utilize same lot size for their production.
- Firms have to pay 's' transportation costs per unit of product to transport to city center.
- There is an alternative use of agriculture reflects from $r_c(d)$ based on the distance to the city center.
- Variable unit costs of production is fixed and identical for all of the firms.
- Building structure cost depicts by 'c' which is identical for all the firms.

In a profit maximizing firm, the Housing rent ~~cost~~ function can be derived first & then we can derive the land rent function from that housing rent function.

The difference between land rent function & the housing rent function is the ~~structural cost~~ structure cost (c). We can derive land rent function



by ~~subtracting~~ ^{adding back} structure cost (c) from the housing rent function.

For a profit maximizing firm,

$$\text{Profit}(\pi) = Q(P - A - Sd) - C - R_c(d)$$

When profit is zero, housing rent is.

$$R_c(d) = Q(P - A - Sd) - C$$

From the housing rent ~~of~~ function, we can derive the land rent function by adjusting for lot size after ~~deducting~~ ^{adding the} the structure cost.

Land rent function for profit maximizing firm,

$$r_c(d) = \frac{Q(P - A - Sd) - C}{f}$$

$$r_c(d) = \frac{[Q(P - A - Sd) - C] - C}{f}$$

$$r_c(d) = \frac{Q(P - A - Sd)}{f} - \frac{C}{f} + \frac{C}{f}$$

$$r_c(d) = \frac{Q(P - A - Sd)}{f}$$



Land rent function for profit maximizing firm.

(The figure after the part c at the question shows the rent function)



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c) Land rent gradient for profit maximizing firm can be derived as:

$$\frac{\partial R}{\partial d} = \frac{-s_1}{f} - \frac{s_2}{f}$$

According to the land rent gradient, the distance slope of the land rent function will be determined. So when the transportation cost for the firm increases there can be a decrease in the land rent. It means land near to the city center has higher rent than the land away from the city center.

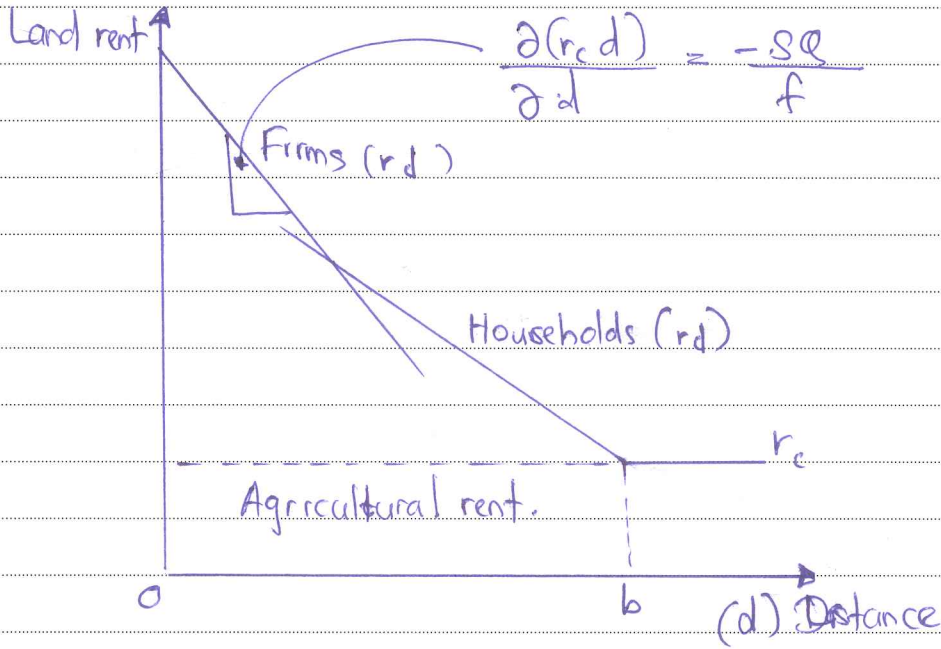
Further the production per unit of land also affects for the determination of where to locate in the city. When firms produce large quantities, they have to pay higher transportation cost to transport the products to the city center. If a firm produces large quantities per unit of land, they may require a small plot of land & they can reside very close to the city center.

Accordingly, the land rent gradient says the firm's location will be determined by the transport cost per unit of product & the ~~per unit of~~ production quantity per unit of land.

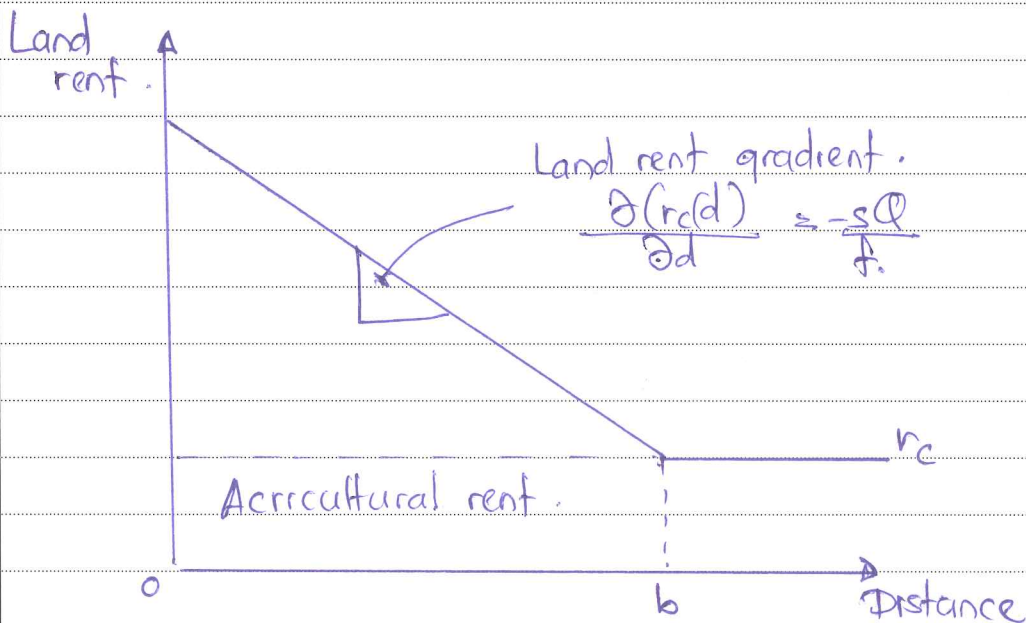
Figure →



Figure showing the land rent function & land gradient.



Alternative figure only showing firms,





d) When we consider about ~~at~~ the nature of the profit maximizing firms, we can identify them ~~it~~ in two categories

- Offices

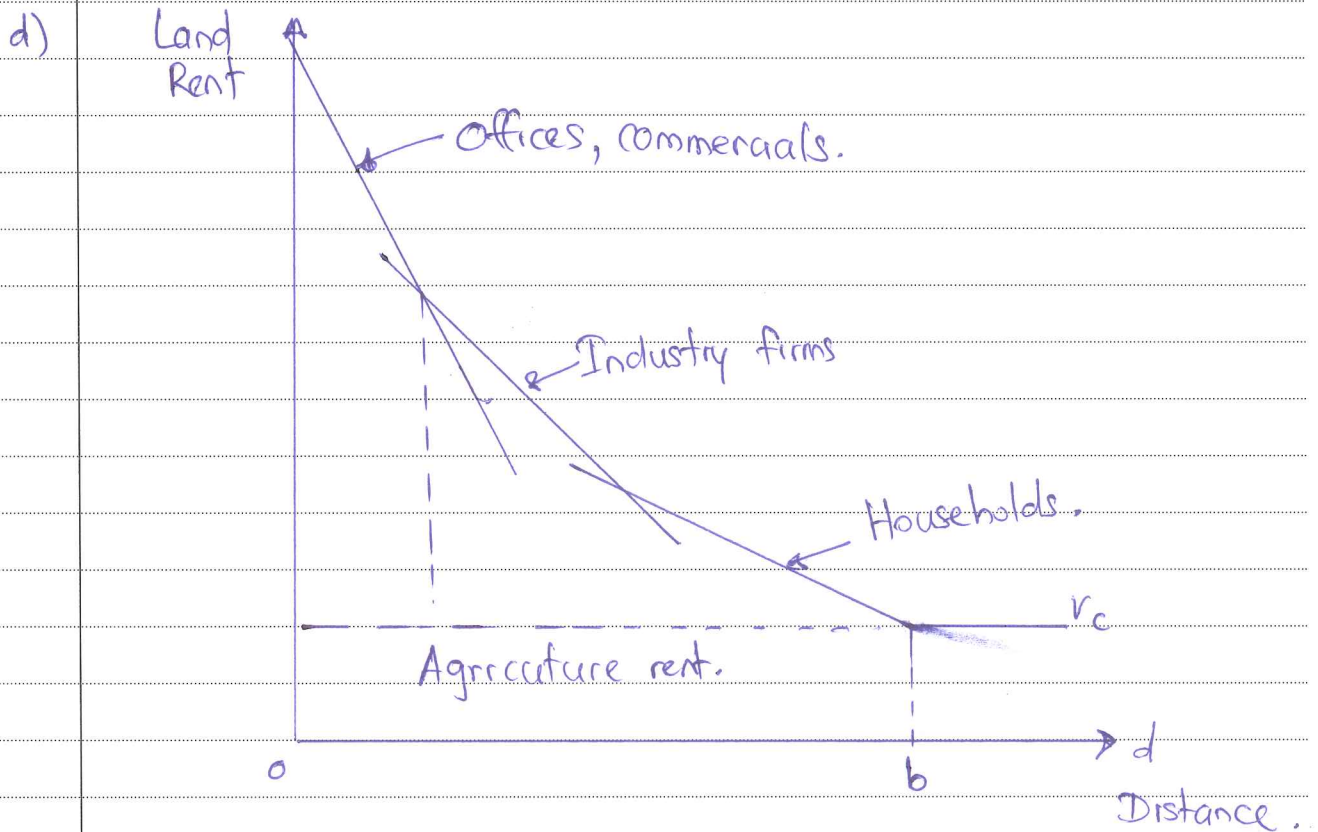
- Industry firm etc.

Offices are the category of firm which produce higher amount of output quantity by using a small lot of land. For instance if it is a service providing office, their output quantity is large as well as output per lot size of land is very high. Thus they locate very close to the city center. They can expand vertically also, to produce larger quantities.

In concerning about industry firms, they require large lot of land (large lot size) for their production. The land rent is reduced when they moving away from the city center, but they can compensate the reduced amount of land rent for the transport expenses of their products to the city center.

According to the product quantity produced using the land area, thus offices reside very close to the city center and the firms/factories/industry firms locate at more distant locations from the city center.

The location of each firms can be shown in the following figure.



According to the figure offices ... pay higher rent and their rent function (curve) is more steeper than the industry firms.

Steepest rent function (curve) will locate in the city center.

e) By using the figure in part (d) we can explain the different between land rent gradient for commercial & industrial firms.

Since the commercial buildings produce larger quantity by using a small amount of land, their land rent gradient is more steeper than that for industrial (buildings) firms. Thus the land rent function curve for commercial firms resides very closer to the



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city center. On the other hand, the industry firms do need large lot size per unit of production & thus they locate far away from the city center before the household lives. They pay lower amount of land rent, but they have relatively higher transportation cost. The amount of land rent they save from locating away from the city center can be compensated for the transportation cost of the firm.

A) Spatial equilibrium shows a situation where the land rent & transportation cost are compensated each other for the firms where they locate within the city center or away from the city center. They would consider these compensation to cover the transportation cost when they build ~~they~~ their firms away from the city center.



Assignment 03

a) When a profit maximizing land owner who develops a site for residential use only, he must consider following factors.

- The land is only use for residential purposes. Accordingly the model assumes that the land is using only for residential use only.

- Government /municipalities regulations.
there are certain regulations for building residence from government & certain municipalities. such as roofing, the parking area, colors, the distance to the roads etc. The landowner should consider about all these factors when building residents.

- Preferences at households.
Preferences at households for smaller or larger amount of area within a residence area also should consider when developing a residential area.

- Neighbouring factors.
The effect of certain building or residence for the neighbouring residents & their life behavior also should consider in building a residential building.



- Cost of production / building.

When the floor area is larger, the cost of production/building is also higher. So when deciding the optimal density level, the landowner should consider the cost of building of the certain level of density.

b) In deciding the optimal size of density, the model is based on certain assumptions.

- The land is only used for residential purposes.

- The floor area will denote by F which is dependent on the cost of constructions as well as the willingness to pay of residences to the certain floor area.

- The price of the housing as a function of floor area can be shown as. (according to the willingness to pay)

$$P = \alpha - \beta F$$

Where

α = all the other factors affect to the price of a ~~flo~~ certain resident ~~accept~~ other than the floor area.

β = is the relationship % of floor area size to the price of the resident/house.



→ The cost of construction of certain house with 'F' amount of floor area can be shown as,

$$C = \mu + wF$$

Where

μ = all the factors affect to construction cost other than the size of the floor area

w = the change in the construction cost due to the size of the floor area used for the construction.

→ In maximizing the profit at this density level at construction, the profit function can be shown as a function of floor area set as below.

$$\text{Profit}/\pi = (P - C)F$$

$$\begin{aligned} &= (\alpha - \beta F - \mu + wF)F \\ &= \alpha F - \beta F^2 - \mu F + wF^2 \\ &= \alpha F - \mu F - \beta F^2 + wF^2 \\ &= F(\alpha - \mu) - (\beta - w)F^2 \end{aligned}$$

From the first order condition at this equation, we can derive the optimal level of F.

$$\pi = (\alpha - \mu)F - 2F(\beta - w)$$



When in the profit zero,

$$\begin{aligned}\pi = 0 &= (\alpha - \mu) - 2F(\beta - w) \\ 2F(\beta - w) &= (\alpha - \mu) \\ F &= \frac{(\alpha - \mu)}{2(\beta - w)}\end{aligned}$$

Thus the optimal level of density F can be shown in following function.

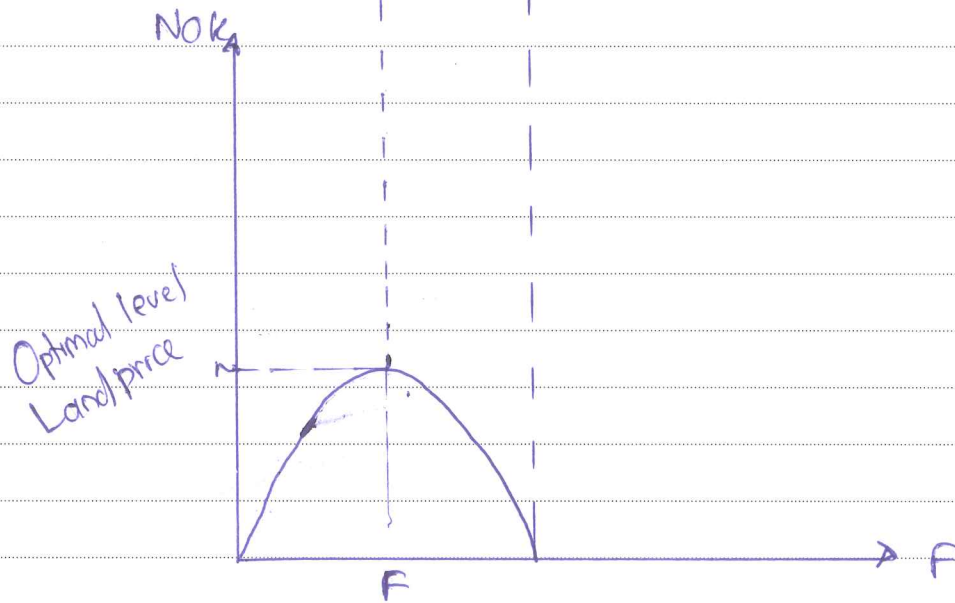
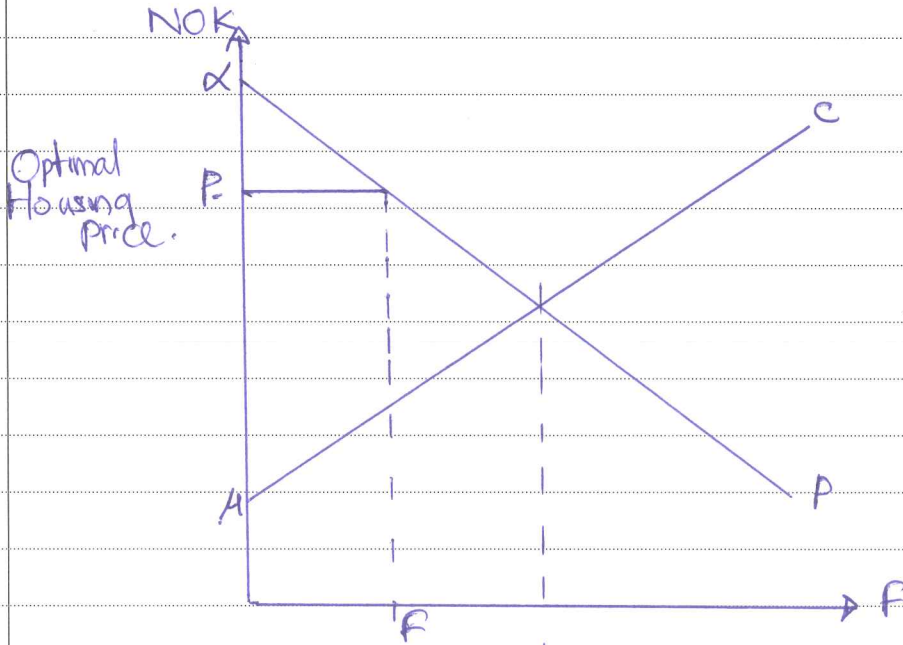
$$F = \frac{(\alpha - \mu)}{2(\beta - w)}$$

According to the optimal level at F , we can derive the housing price & the land price.

The following graph is showing the optimal the housing price & the land price in the optimal level at (F) floor area density.

The horizontal axis shows the floor area (F) and the vertical axis shows the price.



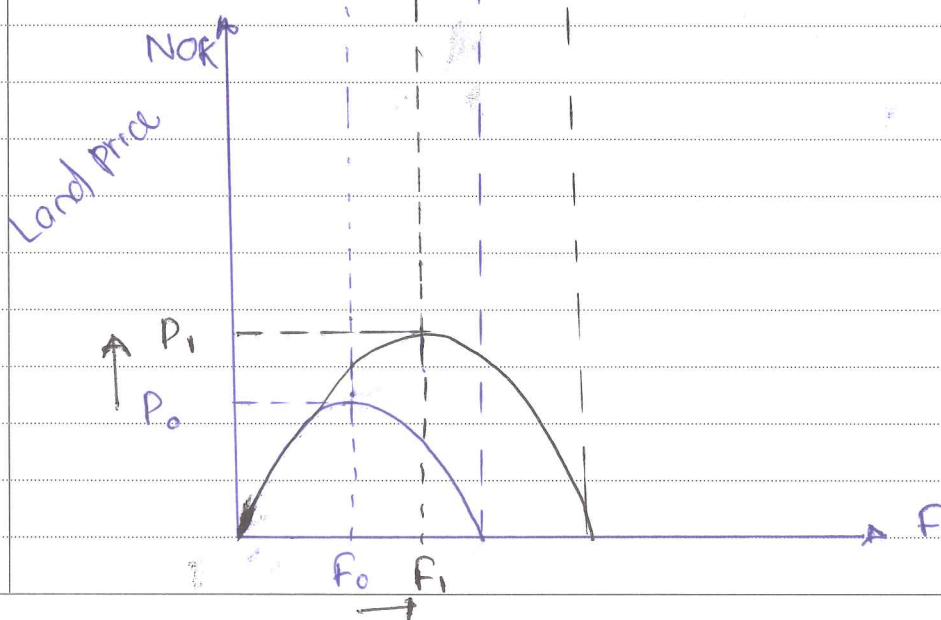
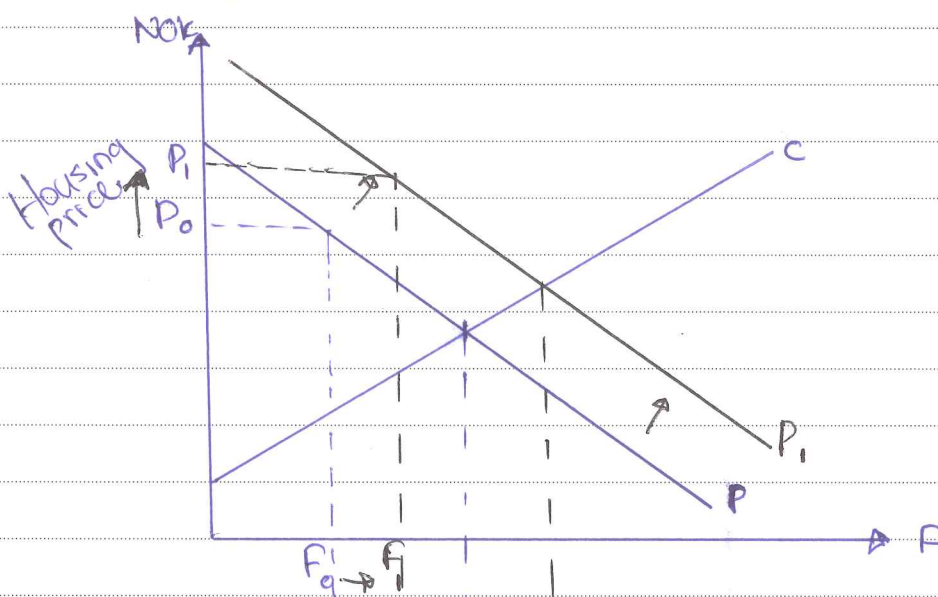


According to the figure the first graph shows the housing price at the optimal level - at (F) area. & the second graph shows the land price at that certain optimal level of (F) density.



c) If landowner's site is considered more desirable, then the price function ($P = \alpha - \beta F$) will shift outward due to the willingness to pay for the certain density increased.

According to this change in the market, the price at certain density (F) floor area of housing, as well as the land prices will increase. This change can be shown in following graph.





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According to the above graph, the changes in the market affect on both housing prices & the land prices. Since the site is more desirable, the optimal level of land floor area has been increased as well as the related prices of land & housing also increased.

- d) As I explained in the question part (c), both housing prices & land prices would increase due to the changes in the market.

According to the desirability of the site, the consumer's willingness to pay for the certain housing in that plot of land increases. According to this increase, the function (curve) shifts outward. Thus both housing & land prices increased.

- e) Redevelopment will occur only if the following condition meets.

$$\text{Net value at new construction} - \text{Demolition cost} > \text{Gross value at existing structure}$$

The net value of new construction is greater than the sum of gross value of existing structure and the demolition cost will allow the condition for redevelopment at the certain site.



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In other way,

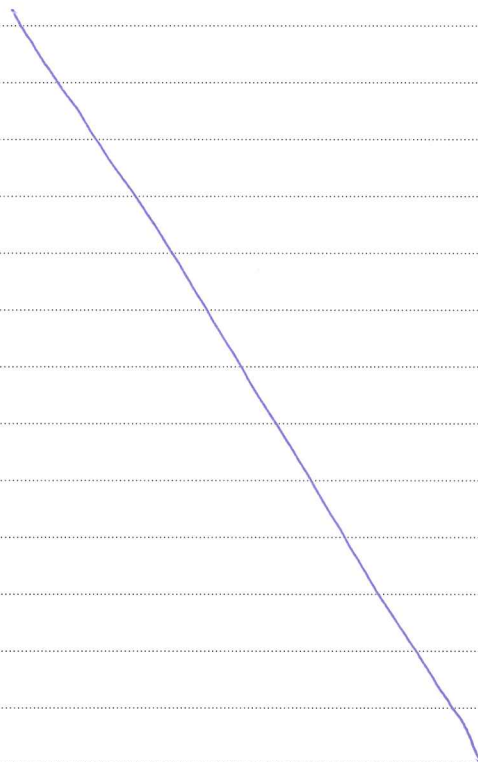
Net value of new construction - Gross value of existing structure > Demolition cost.

$$F(P - C) - F^0 > SF^0$$

$$F(\alpha - \beta F - \mu - \omega F) - F^0 > SF^0$$

$$F\alpha - \beta F^2 - \mu F - \omega F^2 - F^0 > SF^0$$

If only the above condition meet, the redevelopment will occur.





Assignment 02

a) Housing wealth effect explains the differences of other consumptions at households due to the changes in housing prices.

For instance when there is an increase in housing prices the income left for other consumption such as daily consumption, investment, savings will be affected.

Housing wealth effect can be materialized with different channels.

- Consumption channel
- Investment channel
- Banking sector.
- Inflation channel
- Gross national production.

* Consumption channel.

When there is an increase in housing prices the consumption is affected. But it can be concerning in different perspectives. For instance housing can be treated as an asset which people invest their money on. If there is a rising housing price, their wealth is increasing. This effect can be taken based on following conditions.

- Willingness to sell or invest on a housing,
- Ownership of housing
- Willingness to use as a collateral for getting more loans / financial

Accordingly when there is a higher



housing prices, consumer wealth ~~is~~ is also increasing. They can sell the property & get the more money or they can use it as asset to access to financial institutions.

* Banking sector.

When there is rising housing prices, in the banks, their balance sheet shows higher ~~per~~ property values. They can use this higher asset values to offer more loans to the people. On the other hand bank can earn more interest from those loans offer to the public. On the other hand, increase of housing prices lead for more construction in the housing market, again banks get more opportunity to give more loans and create wealth.

* Investment sector.

Increase in housing prices apparently affect for new constructions in the housing market. These new construction allows new cash flows into the market where economy gets more benefits from the development. In the balancesheets at construction companies shows the higher values at their properties, in turn they can have an opportunity to get bank loans for further investment.

* Inflation & channel.

Increase in housing prices increase the value at housing in consumer price index when we consider the inflation. Accordingly the value related to inflation



index would rise due to this change. This will affect to the whole economy showing that there is a higher rate of inflation & the inhabitants are more wealthy. But again this higher inflation rates would show the economic instability.

* Gross national production.

Rising housing prices show higher amounts in GNP for the sections of housing & income.

b) The major risks associated with buying a house can be shown in following facts.

→ Changes in housing prices.

Housing market is dynamic market where a lots of factors affect for the demand and supply at the market. The demand for housing will depends on area specificity, location, public services provided in the area, distance to the city center ... etc. Accordingly there will be changes in these macro economic variables in the long run which affect the housing prices. Thus the house which we buy for a higher price now will be not an attractive option in future. Always people who buy houses will affect from this factor at changes in housing prices due to macro-economic variables.



→ changes in government regulations

changes in government regulations also affect negatively or positively on a buyer at a house. For instance different tax policies for different times, (tax incentives for housing, tax reliefs for housing loans, head taxes etc), changes in area adjustment (change the main city area), development of infrastructure will determine the attractiveness of certain housing area. So the buyer at houses will be exposed to all of these factors.

→ Reduction of value due to new technology & preferences of generations.

Housing market is continuously developing market with different technologies as well as comfortable furnishing and other facilities. And also there would be changes in different housing preferences at different generations. Thus all these factors affect for the value of house.

→ Rental price changes.

Ownership of a house would be sometime higher costlier than renting a house. If the space market offer reasonable rent than one should pay for the loan for buying house, one can decide not to buy a house.

According to the nature of the housing market, always the buyers have a risk.



c) House-price bubble is a situation where the house price increase in a larger percentage in a shorter period of time. Since the construction of new houses would under different constraints, some speculative buying of houses also accelerate the higher demand for housing.

In the short run space supply is inelastic, due to that reason there is no way of managing the rising house prices in the market.

Housing bubble will occur due to the future expectations & other fundamental factors.

* Expectations

If there is an expectation of a future ~~rise~~ increase of housing prices, the demand for housing in the present would increase. Since the supply is inelastic in short run the prices will increase. Speculative buying also happens with the aim of earning profit from that.

* Fundamental factors.

Other fundamental factors also affect for the housing bubble. Such as decrease in interest rates, favorable tax incentives for housing purchases also can be considered as other factors which affect for increase in demand for housing in short run.

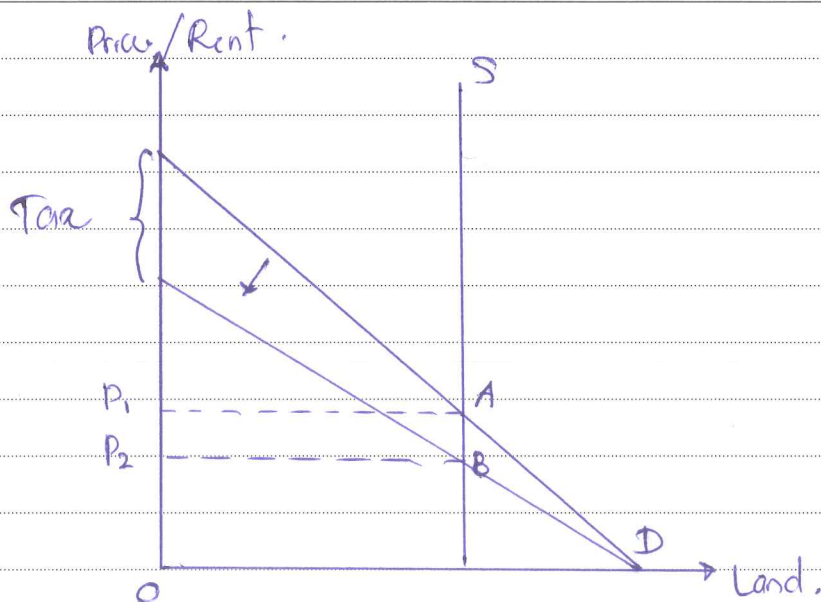


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d) House-price burst is the situation where the housing prices decrease. To decrease in housing prices, there can be some ways that can use for reduce the impact at reduction at housing prices. For instance impose at taxes, provide incentives for living in rented areas etc. or change the preferences at inhabitants like being in one family etc.

In a house price bubble, there will be another problems coming into the economy. Such as if people needs to pay more at their income on housing purposes, their income for other consumption would be lower. These situation lead them for more borrowing. The burden is again goes to the inhabitants. In this scenario a lots of social & financial problems will occur. Thus housing bubble is so problematic when we consider it in a macro economic perspective.

e) The tax burden of a land value will be paid by the landowner although the tax bill received by the landowner or tenants. Since the supply at land is inelastic, the only way at adjustment at prices in the market is the demand side. The tax ~~burden~~ burden of land tax can be explain with following graph.



According to the graph, the equilibrium points A, B shows where the tenants pay the prices. Earlier they were in equilibrium at point A the price P_1 . But after the tax Point B but the price is P_2 .

In this scenario land owner get the same less amount than before and tenants will pay the same amount but the rest will go to the tax payment.

