

Congestion Taxes and Land Use

The slope of the residential bid rent function is determined by the slope of the housing price line.

The slope of the housing price line is determined by commuting cost.

Congestion taxes increase the cost of commuting and thus the slopes of the housing price line and the residential bid rent function, i.e. the slope gets steeper.

Suppose the congestion tax is levied on a per mile basis so the greater the commuting distance the greater the congestion tax paid.

Suppose a congestion tax is imposed and other taxes are not reduced. Let R_0 be the initial bid rent curve and R_c the bid rent with congestion taxes. The effects of the congestion tax are:

1. The slope of the housing price line and thus the bid rent curve gets steeper due to the increase in commuting cost caused by the congestion tax.
2. The bid rents decline at all locations since the increase in commuting cost leaves households with less to spend on housing.
3. The decline in bid rents increases with distance from the center since congestion taxes and commuting costs are increasing with distance, leaving households with less and less to spend on housing.

Suppose that other taxes are reduced to offset the congestion tax. Suppose this results in bid rent curve R_c . Relative to bid rent curve R_0 , the effects are:

1. The tax offset gives household more to spend on housing at all locations so the bid rents are also higher at all locations.
2. The slope of R_c is flatter since the congestion tax reduces trip time and lowers commuting cost, partially offsetting the effect of the congestion tax on the slope of the housing price line and residential bid rent function.

Relative to bid rent curve R_0 , the effects are:

1. The congestion tax increases bid rents close to the city center. Locations near the center become more attractive because congestion taxes are low and are dominated by the decrease in other taxes and the lower time cost of commuting.
2. The congestion tax reduces bid rents away from the city center. Locations at a distance from the city center become less attractive because the decrease in other taxes and lower time cost of commuting are dominated by higher congestion taxes.

So inside u^* , households consume less land due to the increase in bid rents so population density increases inside u^* . Outside u^* , households consume more land due to the decrease in bid rents so population density declines outside u^* . So the congestion tax produces a more compact city.