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Spring 2005

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EXERCISE 2: MULTIPLE LOCATIONAL EQUILIBRIA

In this exercise we use a linear, 1-sided city with a unit width. It is one sided because of its center is located on the water. In this city, employers (industries) need 5 miles of land (length from water) and residents (workers) need 15 miles. The density of each is fixed. The question is the location of the two uses: center (near water) versus periphery (inland).

With shipping costs to the water (center of the city where distance=0) industry land price gradients must decline \$50,000 per acre for each mile from the water. Resident workers also value proximity to water - as a place to recreate and their land price gradients decline \$100,000 per acre for each mile from the water.

A complicating factor is that in addition to considering commuting to work, residents value *separation* from industries [for reasons of noise, pollution, etc]. Hence resident land prices also increase \$66,666 per acre for each mile (in any direction) that they are farther from the nearest industry.

At the most interior location of the city (20 miles inland from the water) the price of agricultural land is \$10,000 per acre.

With these assumptions:

- a). Write out the formula for the rent gradient for each use.
- b). There are two land use or location equilibria in the model - describe each qualitatively.
- c). Derive the aggregate price gradient (outer envelope of the in the price gradients of each use). What is the price of water frontage at the center under each solution.
- d). In which equilibrium is the aggregate value of real estate higher - argue or demonstrate your answer. What does this imply about the normative value of each solution or the efficiency of each outcome?