Progress Tracker

An Agent-Based Model of Urban Economics:

Evaluating Emergence & Evolution

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| **Week** |  |  |  | **Issues** | **Status** |
| 1 | Landlords | Build Land Area |  | Landlords placed at random on map in setup, travel random directions around map claiming free space. |  |
|  |  | Colouration/ Ownership |  | When creating their own land area, if there was a single patch left within their land they had to travel around at random to find it. | Fixed: If all 4 neighbours (NSEW) were belonging to the same landlord, it will change. |
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|  | Firms | Wage output | Randomised number for the wage gap based on the number of firms. |  | Extend: When the radius is decreased below the limit that allows all firms to be placed within it, reduce the maximum amount of firms on parameter slider. |
|  |  |  |  | Overlapping firms. | Fixed: “in-radius” – each firm claims the space around them so they are unable to stack. |
|  |  | Place within Radius of City |  |  |  |
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|  | People | Love of Variety |  |  |  |
|  |  | Searching for new locations | Ten places selected and costs compared. |  | Not complete  Extend: Bidding over one spot when more than one person selects it. |
|  |  |  |  | Ownership of the selected places was needed to compare the 10 to each other. | Fixing: Pythagoras’ Theorem to compare distances and then calculate costs. |
|  | Calculations | Budget | Y is the budget: this is a Person’s wage after any commute cost has been subtracted. |  |  |
|  |  | Product Cost | PG is the price of goods and PL is the price of land/density. |  |  |
|  |  | Goods Cost | The total cost of the good PG is a function of its non-spatial base cost pg, the distance it needs to move (d), and the delivery cost to ship it over a unit of distance (c). |  |  |
|  |  | Land Cost |  |  |  |
|  |  | Utility Cost |  |  |  |
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### Experiments

See below for standard elements

*Spatial equilibrium from density cost and Landlords*

Modelled on one firm

After 250 iterations

“People’s consumption of land dropping towards the centre: they are finding the utility-maximising option is to squeeze into less land per Person; land costs rise towards the centre of the settlement.”

A similar (though not identical) pattern emerges via density cost also, purely through the choices made by People responding to density.

These include all of the key variables and will be the first tests carried out on our model. Swapping out *Land* costs for *Density* costs.

*Spatial morphology: reaction to cost changes*

“What drives agent location choice to produce stable emergent equilibria?”

This section looks at how *People* in the model respond to changes in costs, as reflected in settlement size.

To avoid any agent’s ‘locking-in’, each time an increment is made the model must be fully restarted.

*The impact of differences in wealth and preferences*

Four different wealth points so that the richest *People* are four times wealthier than the poorest.

In the paper they demonstrate a bidding system, based upon ABM (Account-Based Marketing) models. When two or more agents pick the same piece of land and consequently bid for rental rights.

*Analysis of two and three Person decisions*

This is a mathematical model in the paper but should enable a basis for us to test our agent based model around.

It includes communication between agents in order to “decide” how to share land and commute costs between each other.

“Economically, the impact of People's choices on proximity costs cause externalities for others: if ‘my’ location decision is before others, it will change land or density costs for them with no compensation being made (Button, 2010, p. 161)”

