Modeling Workers and Firms in Striking Conditions
Fall '18 — Cole Vick

Using economic methods (e.g. game theory), construct your own economic model of a social behavior, interaction, market, or exchange (broadly construed). Alternatively, you may substantially modify an existing model and explore the effects of the modification. Models should be well motivated and explained in detail. Papers should also present a clear analysis, draw some substantial conclusions on the basis of the results, and discuss a connection to a key philosophical issue or question.

0 Motivation

The main motivation for this model was to see how strikes spread throughout a population. If you look at the news today there are countless articles on strikes spreading throughout different industries. A quick Google search shows strikes "spreading" in the hotel market in the United States, prison strikes in Canada, and McDonald's strikes in Britain. I ask the question: why are these strikes spreading and what happens to the firms and the workers once a strike has taken place?

1 Overview

The question that I asked myself when considering strikes in general was: why does any given strike fail or not? One can think of any number of possibilities and scenarios that seem to have a reasonable effect on the success rate of a strike. The number of workers that go on strike, productive output of any given worker, rising operational and living expenses, for the firm and strikers respectively. In the model, to get at the rising cost of living I have the expenses for workers increase on each iteration of the model when the agent is in a working state. In the model, I single out the productive output of workers as the main factor for firms to acquiesce to a strike and the rising cost-of-living as the main factor for workers inciting a strike. The other main factor for workers is the connectedness of their striking group.

The most salient from these for worker's decisions would be living expenses. With rising cost of living in many major urban centers in the United States, I think that the justification for including this in the model makes intuitive sense and will allow a closer approximation of what may actually occur in the real world. From the Brookings Institute analysis on wage growth, they state that "the share of output workers receive has generally fallen over the past few decades" (Thirteen Facts About Wage Growth, Brookings Institute). From this, it's clear why workers in the United States are striking. In the model, instead of representing the falling wage I represent growing expenses on the workers. Either way, the worker is forced to take some action to make their fiscal life more manageable. To begin, the user sets an expense range and expenses in that range are randomly assigned to each worker. From a worker's wage and

expenses we can calculate their state at any time from the following expressions:

$$if\ wage > expenses[state = "working"]$$

$$if\ wage < expenses[state = "willing"]$$

The calculation for these two states is straight forward. The third state, striking, will require a discussion of connectedness. Another core point in the worker's decision to strike is how connected a given work force is. In the model, you are able to change the amount of connectedness, or support, that a given agent must have from their neighbors in order to change from a willing to strike state to a striking state. If an agent is willing to strike we calculate if they are now striking from the following boolean statement:

$$count(turtles - onneighbors)with[state = "willing" or state = "striking"] > connectedness$$

This counts all of an agent's neighbors with either a willing or striking state and checks whether or not the agent is well connected enough to participate in a strike. Being able to change the connectedness from one iteration of the model to the next reveals some interesting properties of both poorly and well connected workforces. The inclusion of the connectedness of a workforce as one of the main strategies for striking models the world closely. The implementation in this model obviously favor the workers with lower expenses.

The most important factor for the firm is the current production of the workers that are currently working versus how much production they are losing from the striking workers. In the actual model, I calculate the firm's willingness to acquiesce to a strike with the following boolean statement:

$$(production * workers - striking) > ((production * workers) - (wage * workers))$$

In plain English, the firm will choose to acquiesce to a strike if the total production lost from striking workers is greater than the production of workers minus the payroll of those workers. I think that this solution for a firm captures the most important factors for a firm if they were only affected by pragmatic reasons for acquiescence. Of course, in the real world a firm would have to consider many other factors such as bad press, the timeframe of acquiescing and how it may add to the worker's disillusionment with the firm itself, and even the firm's own solidarity with the worker's movement.

2 Analysis

To show the model concretely, I'll provide a look at the model when considering a wide range of starting expenses randomized over the workers, a poorly connected workforce, and a low starting wage relative to the average wage of the workers. I choose this specific configuration to begin with because it clearly shows how the strike spreads through the workforce. The workers are all initialized with a working status, and after the first iteration, some workers strike immediately and some continue working but most now transition into a willing state. From Figure 1, we see that there's not too many striking workers yet and if we calculate the

acquiescence conditions for the firm we can see that they are not met. So, the firm refuses to give into the strike and the next iteration begins. In Figure 2 the striking groups have 'convinced' many of their neighbors who were willing to begin striking. At this point, the firm begins to increase wages and makes some, but not all, of the striking workers into working workers. It's difficult to see the contrast between Figure 2 and Figure 3 which shows that the firms strike wage was not high enough to get large portions of the workforce back to work. This small example of three iterations shows how large a strike can grow from just a few assumptions about the connectedness and expense distributions can lead to large scale strikes in a workforce. I have also included some interesting plots in Figure 4 that help to show these relationships more clearly.

3 Philosophical Implications

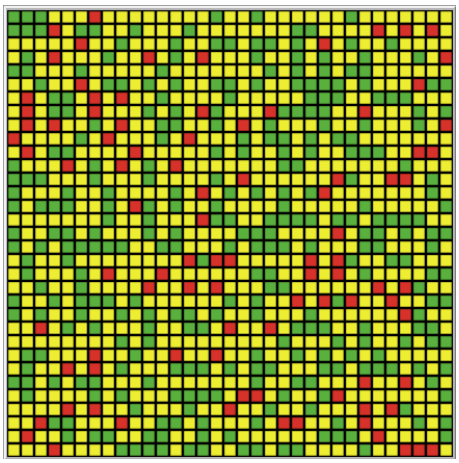

Figure 1: Beginning of a strike: working=green, willing=yellow, striking=red

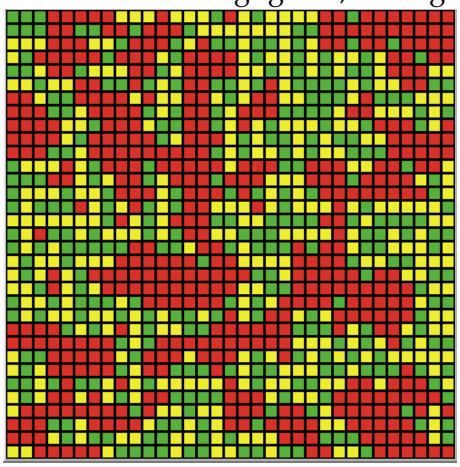

Figure 2: Heavy Striking

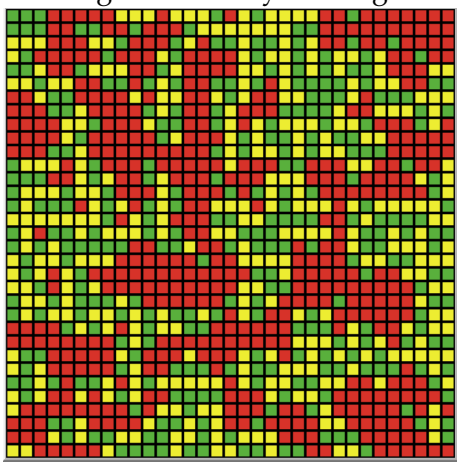

Figure 3: Less Striking

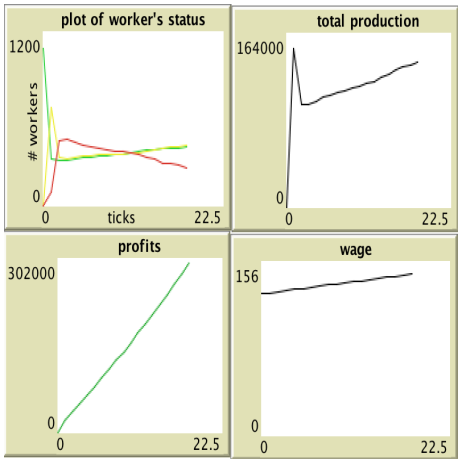

Figure 4: Graph of Figures 1-3

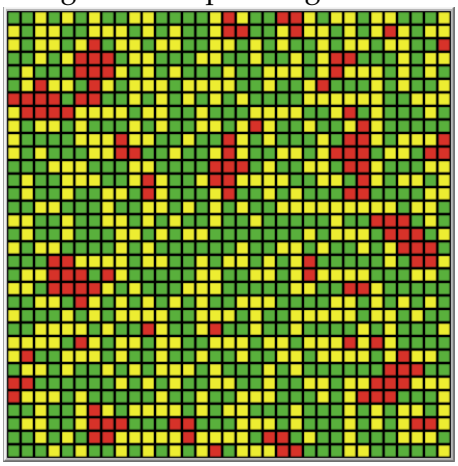

Figure 5: Mostly working after many iterations

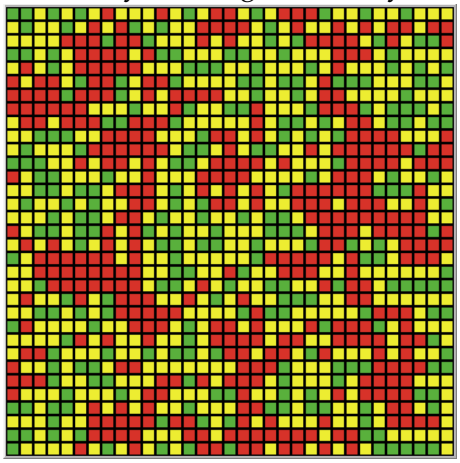

Figure 6: Strike spreading

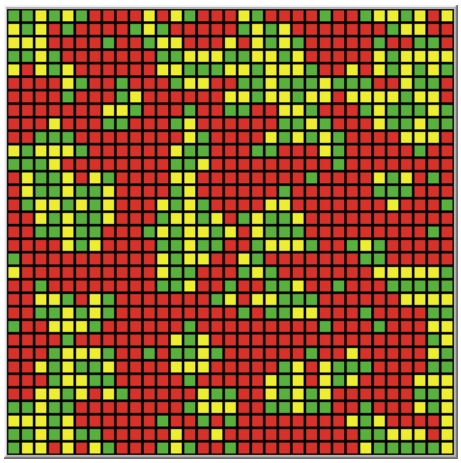

Figure 7: Intense spreading and islandization of working groups

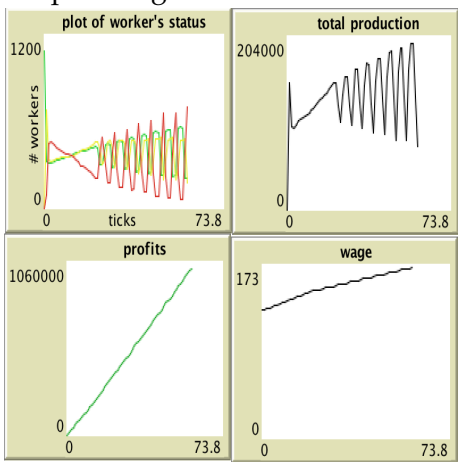

Figure 8: Graph of Figures 5-7

4 Works Cited