Supercomputing in Social Science

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- What would happen if *many* families in the largest U.S. metropolitan areas received vouchers for private schools?
- Completed my dissertation with Condor's help
- The contributions from my research are made possible by Condor
  - Questions could not be answered otherwise

Research question

- vouchers allow people to choose the type of school they want
- vouchers may affect where families choose to live

→ Problem has many moving parts (a general equilibrium problem)

How do we deal with these what-if questions?

- write a model that stylizes observed reality without vouchers
- make sure the model replicates reality as well as possible
- run what-if policy simulations

Replicating reality through the model

- Data → Model → “Predictions”
- … but predictions depend on parameter values
- we need to choose parameters that best match the observed reality

Optimization problem:

- non-smooth → use a grid search
- search over the parameter space (dim=5)
- whole search would take about 4.5 years with just one processor

What do researchers in Economics normally do in these cases?

- “pick” a parameter point
- … but this is economically and statistically not satisfactory
- answer more limited questions

How I used Condor

- I designed a parameter grid
- submitted thousands of jobs, each one evaluating several points on the grid
- retrieved results from my desktop, and analyzed them

Why Condor was a great match to my needs

- a very large number of independent computations
- large amount of resources
  - 150/200 processors on average
  - Solving optimization problem took a week on average
- management capabilities
- easy to use
  - there was a fixed cost, but small relative to the benefits

Why Condor was a great match to my needs (cont.)

- I did not have to alter my code
- I did not have to pay
- since 19 March 2001 I have used 462,667 hours (about 53 years with one 1 Ghz processor)

How do Econ researchers react to Condor?

- “very clever idea! I wish we did the same at ….”
- researchers are unaware of these opportunities
  - nature of the problem
- researchers perceive access to supercomputing as very complex

Only few researchers in Econ use supercomputing. Why?

- lack of programming training
- “brute force” flavor
- people want “desktop techniques”
- large fixed costs
  - code – may be device-specific
  - administrative issues

To conclude….

- “democratizing” the access to supercomputing devices – Condor did this for me
- making resources available to young researchers
- we could push the frontier much further using supercomputing resources