Taking a few moments for CAED
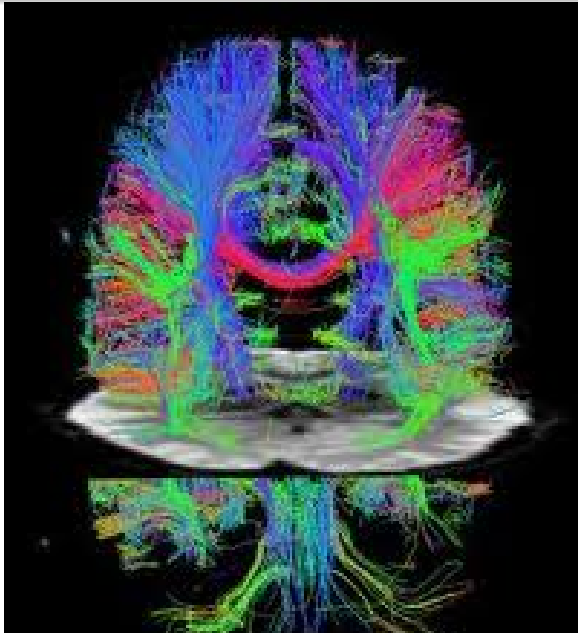
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What import research questions can be answered with CAED?

- Once you start thinking about productivity...
    - it's hard to think about anything else.
- Analyse enterprise data to:
    - understand mechanisms
    - measure effects, responses
    - evaluate policy
- 'Comparative' cross-country analysis aids identification

Current CAED research

- Trade, FDI
- Wages, workers
- Investment frictions
- Reallocation, Misallocation
- IO, Competition
- Regional, Urban
- Innovation, Growth

Current CAED research

- Some topics missing from this year's CAED
  - Energy
  - Environment
  - Management practices

Current CAED research

- Firm-level data, official statistics
- Linked registers, surveys
- Proprietary firm-level (Orbis)
- Not much cross-country comparison

Cross-Country Research

- Confidential Firm-level data from multiple countries cannot be combined
    - Instead, researchers use data such as Orbis
    - Or, replicate a study in multiple countries
- Other possibility: collect moments to merge into cross-country industry data
    - Cross-country projects sponsored by OECD, WB, and recently Eurostat
    - Analysis of moments provided some key insights into firm dynamics

Analysing Cross-country moments

- Job creation and destruction
- Entry and Exit rates
- Firm survival
- Productivity decompositions
- Productivity dispersion
- Covariance productivity-size (OP cross-term)
- Joint moments across surveys (eg ICT and Innovation)
- 'Industry' data aggregated using firm-characterisitics (other than industry)

Shortcoming of previous work

- Unclear what the theoretical basis is of given moments
    - Is an increase in entry/exit a good thing?
- Unclear with what metric to make comparisons
    - What is optimal size-productivity relationship

Example: variance of productivity

- In Hopenhayn (1992) model there is an endogenous productivity cut-off
- Given an exogenous process of shocks to firm-level productivity, the observed productivity dispersion in operating firms will differ.
- For example, in recent work on exit costs and productivity, a 2-sector matching model gives the relationship between observed productivity dispersion and ex-ante dispersion:

$$\widehat{\sigma}^2 \;\; = \;\; \frac{\lambda}{\delta + \lambda} \left(\int_{x_d}^{\infty} z^2 dF\left(z\right) - \frac{\lambda}{\delta + \lambda} \left(\int_{x_d}^{\infty} z dF\left(z\right) \right)^2 \right).$$

Example: OP Cross-term

- While the OP cross-term has a nice intuitive interpretation as the difference between average productivity and weighted average productivity, its relation to aggregate productivity and welfare is model specific

- In recent work, the co-movement of the OP cross-term and welfare in response to changes in economic environment is shown through simulation of a calibrated model

- The OP gap responds 'better' to changes in policy than productivity dispersion, using a more realistic model.

Comparative of analysis of cross-country moments

- Reduce marginal costs of building/tweaking/simulating heterogeneous firm models
    - use 'object oriented' open source code to build a laboratory for heterogeneous firm models
- Reduce marginal costs of collecting cross-country moments from linked register-survey data
    - Eurostat project
    - Data Without Boundaries
    - New proposal for Micro-moment Retrievel Facility

Heterogeneous Firm Models

- Elemental models: Ericson and Pakes (1995) Markov Perfect Equilibrium. Computationally feasible with a few incumbents
  - Allows rich dynamic decisions in oligopoly setting
  - Widely used in IO: e.g. Berry, Doraszelski
- Aggregate models: Hopenhayn (1992) where industry state is stationary. Single firm is infinitesimal
  - Allows many extensions
  - Used in trade (Melitz), innovation (Klette-Kortum), finance (Cooley-Quadrini; Midrigan and Xu), Distortions (Rogerson-Restuccia)

Heterogeneous Agent Models

- Weintraub, Benkard and Van Roy: stationary eq of aggregate in asymptotically large market approaches MPE if stationary eq (SE) of state obeys a 'light tail' condition

- Oblivious Equilibrium: each firm's strategy a function of its own state and long-run industry state: ignore competitors' states.

- OE of dynamic heterogeneous agents with imperfect competition are readily solved

OE laboratory in Python

- OE solver in C++ available by Jeziorski-W-B-VR
- To improve ease of replication and extensions, I am guiding a project to create a flexible, object oriented heterogeneous firm 'laboratory'
- Various generic classes have been written
    - Markov chains
    - Production Functions
    - Transitions
    - Profits
    - OE Solvers

OE laboratory

- Using the software, we can take models to data
    - Calibration
    - Simulations
    - Indirect Inference
- Marginal cost of modelling will be greatly reduced
- But, need for relevant (cross-country) data moments

Cross-country analysis of firm-level data

- Eurostat ESSLimit project (session on Friday morning)
  - Common code sent to 15 EU countries to run on linked surveys (BusReg-ProdSurv-ECommerce-CIS)
  - Micro-aggregated country/industry/time database to be made available to researchers
- Data Without Borders (DWB, see Stefan Bender)
- Micro-moment retrieval system
  - A 'remote execution' system, where customized data moments can be generated in multiple countries
  - Because of confidentiality, output quantity limited

Does macro matter?

- While long-run productivity is everything, individuals worry about business cycles.
- Firms worry about uncertain future profits
  - Aggregate demand, idiosyncratic demand (taste), and productivity affect profit
  - Standard deviation of firm-level distribution of output growth (.37), employment growth (.30), or productivity growth (.46) is very large
  - Even mean of 3rd minus 2nd quartile of firm-level growth distribution is large (dq=.10 ;de=.07; dtfp=.16)
- Bernanke-Gertler wonder how small shocks can create big cycles
- I wonder why firms facing big shocks worry about 'small' cycles
  - maybe financial constraints matter?