Labor Matching Models: Basic Building Blocks

October 10, 2013

BASIC DSGE ISSUES

- Labor fluctuations at extensive margin (number of people working) larger than at intensive margin (hours worked per employee)

- Labor markets perhaps the important macro market to understand/model more deeply
  - Theoretical interest: Many results from existing frameworks point to it
  - Empirical interest: Labor-market outcomes the most important economic aspect of many (most?) people's lives
  - CKM (2007 *EC*) and Shimer (2009 *AEJ:Macro*) "labor wedges"

- Explosion of DSGE labor matching models the past several years
  - Sparked in part by Shimer (2005 *AER*) and Hall (2005 *AER*)
    - Although their models were not full GE models
  - Not yet clear what problems incorporating labor matching has helped solve….
  - …but has likely shed insight on some issues (e.g., in cyclical fluctuations and in policy analysis, real wage dynamics matter a lot)

- Rogerson and Shimer (2011 *Handbook of Labor Economics*)

Basic Labor Market Issues

- How can production resources sit idle even when there is "high aggregate demand?"
- Coordination frictions in labor markets
  - Finding a job or an employee takes time and/or resources
  - Not articulated in basic neoclassical/Walrasian framework
- Are labor market transactions "spot" transactions?
  - Or do they occur in the context of ongoing relationships?
  - The answer implies quite different roles for prices (wages)
- "Structural" vs. "frictional" unemployment
  - **Structural:** unemployment induced by fundamental changes in technology, etc – dislocations due to insufficient job training, changing technical/educational needs of workforce, etc.
  - **Frictional:** temporarily unemployed as workers and jobs shuffle from one partner to another

BASIC BUILDING BLOCKS

- **Aggregate matching function**

$$m(u_t, v_t)$$

Typically assumed to be Cobb-Douglas (see Petrongolo and Pissarides 2001 *JEL*)

  - Brings together individuals looking for work (*u*) and employers looking for workers (*v*)
  - A technology from the perspective of the economy (just like aggregate production function)
  - Black box that describes all the possible coordination, matching, informational, temporal, geographic, etc. frictions in finding workers and jobs

- **Employment is a state variable (one specific timing; try others)**

Churning of jobs; a job is not an absorbing state

$$N_{t+1} = (1-\rho^x)N_t + m(u_t, v_t)$$

Aggregate law of motion of employment

Number of existing jobs that end: ρ^x exogenous separation rate, but can also endogenize

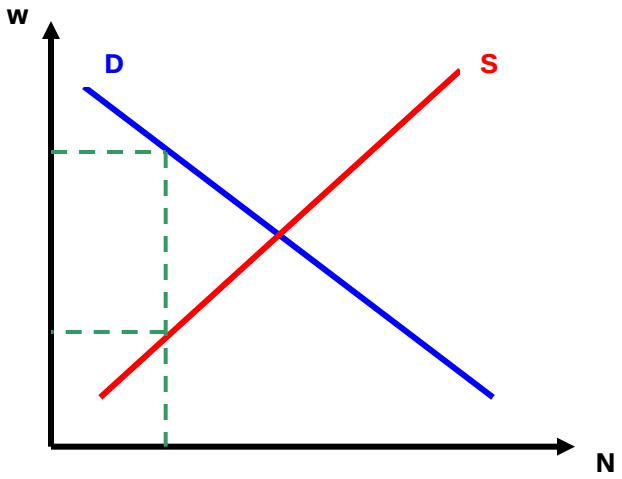
Number of new jobs (matches) that form in *t* and will become active in *t*+1

ANALOGY: $k_{t+1} = (1-\delta)k_t + i_t$

BASIC BUILDING BLOCKS

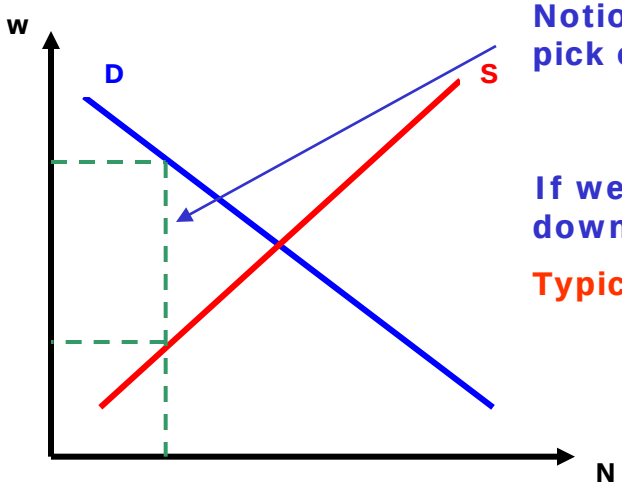
- **Wage determination**
  - **Labor transactions not neoclassical(-based), so no simple supply-and-demand based pricing**

Typical model of "wedge" between $MRS_{C,L}$ and MP_N



BASIC BUILDING BLOCKS

- **Wage determination**
  - Labor transactions not neoclassical(-based), so no simple supply-and-demand based pricing
  - Local (bilateral, *not* market-based) monopolies (local rents) exist between each worker-employer pair
    - Exist due to the matching friction and ex-ante costs of hiring
    - Allows a wide range (too wide?) of wage-determination schemes – one of the points of Hall (2005 *AER*)



neoclassical-based equilibrium quarantines this range of wages

Notion of *matching equilibrium* can pick out these *w*'s…

If we have a systematic way of pinning down a particular *w*

Typical convention: Nash bargaining

IMPORTANT: wage plays a very different role than in neoclassical(-based) labor market – *not* purely allocative, now also plays a distributive role

BASIC BUILDING BLOCKS

- (Generalized) Nash Bargaining

Bargaining powers η and $1-\eta$ measure "strength" of each party in negotiations

$$\max_{w_t} \left(\mathbf{W}(w_t) - \mathbf{U}(w_t)\right)^{\eta} \left(\mathbf{J}(w_t) - \mathbf{V}(w_t)\right)^{1-\eta}$$

Net payoff to an individual of agreeing to wage w and beginning production

Net payoff to a firm of agreeing to wage w and beginning production

Original Nash 1950 was $\eta = 0.5$

  - The unique problem whose solution satisfies three axioms (Nash 1950)
    - Pareto optimality
    - Scale invariance
    - Independence of irrelevant alternatives

- Given an extensive-form foundation by Binmore (1980) and Binmore, Rubinstein, Wolinksy (1986)
  - Nash solution the limiting solution of a Rubinstein alternating-offers game (as time interval between successive offers → zero)
  - In which (η, 1- η) measure discount factors of each party between successive offers

Analysis of Model

- Study firm vacancy posting decision
  - A representative firm that decides how many workers to (try to) hire
    - The typical setup in DSGE labor matching models…
    - …in contrast to partial equilibrium labor matching models (one firm / one job) – but equivalent if sufficient linearity

"Large" firm

- Study household / worker decision(s)
  - No labor-force participation decision in baseline model…
  - Full consumption insurance the norm in DSGE matching models
    - All individuals live in a "large" (infinite) household, so full risk-sharing – equivalently, complete competitively-priced AD assets

- Study wage determination

Pissarides Chapter 1, RSW 2005 *JEL*

Shimer 2005, Hall 2005, Hagedorn and Manovskii 2008

- Aggregate up to full dynamic stochastic general equilibrium

i.e., just the labor-market equilibrium

- Focus on deterministic partial-equilibrium steady state and dynamics
- …before coming back to full DSGE
- Analyze efficiency properties (Hosios 1990 *ReStud*, Moen 1997 *JPE*)