
LABOR MATCHING MODELS: BASIC BUILDING BLOCKS

MARCH 23, 2017

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 ten 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
- ❑ Law of motion for employment
- ❑ Vacancy posting costs
- ❑ Some wage determination mechanism (Nash or many others...)
- ❑ Intensive (aka “hours”) margin?
 - ❑ Typically absent
- ❑ **Endogenous labor “supply” decision?**
 - ❑ **Typically absent...**
 - ❑ Can consider it implicitly in the background (might depend on the wage determination mechanism...)
 - ❑ ...or consider it explicitly by introducing a third activity for individuals (“outside the labor force”)

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

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

Churning of jobs; a job is not an absorbing state

$$n_{t+1} = \underbrace{(1 - \rho_x)n_t}_{\text{Number of existing jobs that end: } \rho^x \text{ exogenous separation rate, but can also endogenize}} + \underbrace{m(u_t, v_t)}_{\text{Number of new jobs (matches) that form in } t \text{ and will become active in } t+1}$$

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

- ❑ Vacancy posting costs
 - ❑ Each new job opening incurs a cost
 - ❑ A **primitive** cost

- ❑ Suppose total vacancy posting costs = γv_t
- ❑ → **marginal cost** of vacancy posting = ...?...
- ❑ → **average cost** of vacancy posting = ...?...

- ❑ (Typical assumption in literature)

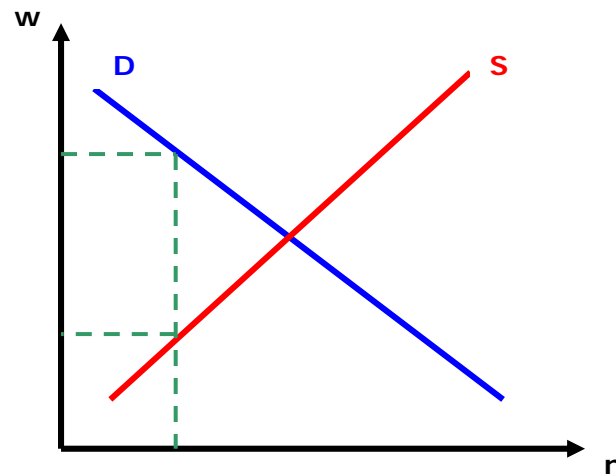
- ❑ Realistic for recruiting departments?

- ❑ If not, suppose convex (concave?) costs of posting vacancies
- ❑ Total vacancy posting costs = $\gamma g(v_t)$
- ❑ Does **marginal cost = average cost ?....**

BASIC BUILDING BLOCKS

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

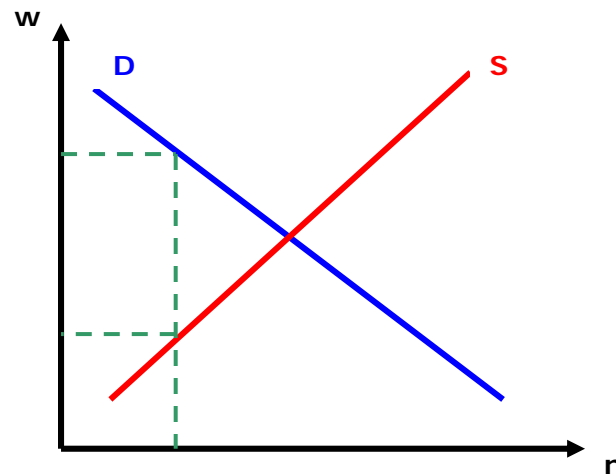
Walrasian
"wedge"
between
 $MRS_{C,L}$ and
 MP_N



BASIC BUILDING BLOCKS

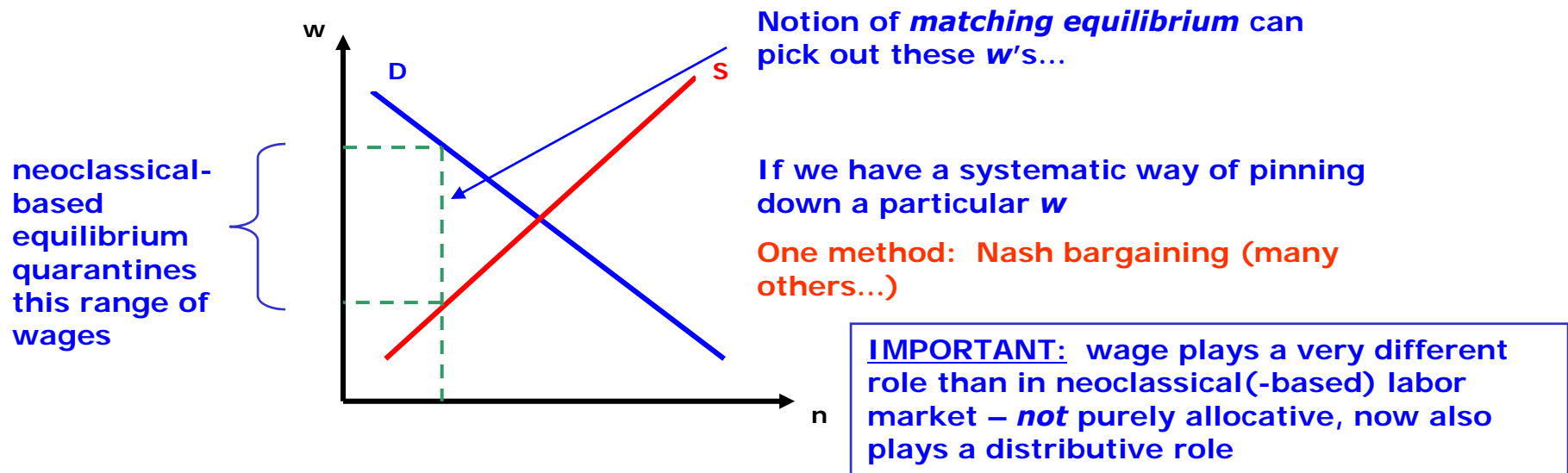
- ❑ Wage determination
 - ❑ Labor transactions not neoclassical(-based), so no simple supply-and-demand based pricing
 - ❑ Local (**bilateral, *not* market-based**) monopolies (local rents) exist between each worker-employer pair
 - ❑ Exist due to the matching friction and ex-ante costs of hiring
 -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

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BASIC BUILDING BLOCKS

□ (Generalized) Nash Bargaining

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

$$\max_{w_t} \underbrace{\left(\mathbf{W}(w_t) - \mathbf{U}(w_t) \right)^\eta}_{\text{Net payoff to an individual of agreeing to wage } w \text{ and beginning production}} \underbrace{\left(\mathbf{J}(w_t) - \mathbf{V}(w_t) \right)^{1-\eta}}_{\text{Net payoff to a firm of agreeing to wage } w \text{ and beginning production}}$$

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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

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□ Given an extensive-form foundation by Binmore (1980) and Binmore, Rubinstein, Wolinsky (1986)

- Nash solution the limiting solution of a Rubinstein alternating-offers game (as time interval between successive offers \rightarrow zero)
- In which $(\eta, 1-\eta)$ measure discount factors of each party between successive offers

ANALYSIS OF MODEL

- ❑ Study firm vacancy posting decision
 - ❑ Representative firm chooses desired number of workers to hire
 - ❑ Typical setup in DSGE labor matching models...
 - ❑ ...in contrast to partial equilibrium labor matching models (one firm/one job) – but equivalent if sufficient linearity

- ❑ 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

- ❑ How do matching markets clear?

- ❑ How are wages determined?