A Tractable Equilibrium Search Model with Experience Accumulation

Jesper Bagger (U Aarhus), François Fontaine (U Strasbourg 3), Fabien Postel-Vinay (U Paris 1, Bristol U), Jean-Marc Robin (U Paris 1, UCL)

ABSTRACT
We present an equilibrium search model of individual labor market careers with human capital accumulation, employer heterogeneity and individual level shocks. The model is estimated on Danish matched employer-employee data. We seek to quantify the roles of human capital and job search in shaping individual earnings over the life cycle. The structural model decompose wage growth into contributions from human capital and from job search, within and between jobs. We find that job-search-related within-job effects dominates between-job effects. Human capital is quantitatively more important for wage growth vis-à-vis job search early in workers’ careers, and is more important for high-skilled workers.

1. MODEL OUTLINE
Production: A worker-firm match produces $Y_t = pH$, where $P = \ln P$ is a firm-specific component and $H = \ln H$ is the worker’s human capital. Human capital: $H_t = \alpha + g_t + \epsilon_t$, where $\alpha$ is a worker-specific component, $g_t$ captures experience accumulation and $\epsilon_t$ is an individual specific AR(1) productivity shock. Transitions (per-period probabilities): Retirement/attrition: $\mu$ Job destruction (if employed): $\delta$ Job offer (if employed): $\lambda_t$ Job offer (if unemployed): $\lambda_0$ Alternative employers have type: $p' \sim F(\cdot)$ Wage contracts: Piece-rate contracts, i.e. $w_t = \ln(\frac{Y_t}{P}) = r + p + \bar{h}$ where $r$ is the endogenous log piece-rate. $E(V(r,h,p))$ is expected value of employment in type-$p$ firm with piece-rate $r$ to a worker with human capital $h$ w.r.t. information available in period $t$. Piece-rate $R = 1 \Leftrightarrow r = 0$ is the best contract a worker can obtain. Hence, the highest value a type-$p$ firm can offer is $E(V(0,h,p))$. Definition: $q = q(r,h,p)$ is the minimum firm-type required to offer the worker an improvement in employment value. That is, $q$ solves $E(V(r,h,p)) = E(V(0,h,q))$ for type-$p$ firm.

2. WAGE SETTING
Consider a worker with human capital $h$ who are employed in a type $p$ firm who are approached by a type-$p'$ firm. The two firms Bertrand compete for the worker’s services.

Outcome of the game (3 possibilities):
1. $p' > p \Rightarrow$ worker moves to poaching employer (type-$p'$) where she is offered contract $r'$ s.t. $E(V(r',h,p')) = E(V(0,h,p))$.
2. $p > p' > q \Rightarrow$ worker remains employed at the current employer (type-$p$), but the worker’s contract (piece-rate) is improved to $r$ s.t. $E(V(r',h,p')) = E(V(0,h,p))$.
3. $p < q \Rightarrow$ worker remains at current employer. Poaching firm (type-$p'$) is not productive enough to improve the worker’s current contract since $E(V(r',h,p')) < E(V(0,h,p))$.

The wage equation: Working out the value fcts one arrive at the following wage equation (i index workers, $J(i,t)$ maps workers into firms): $w_t = p_{J(i,t)} + \alpha + g_t + \epsilon_t - \int \frac{\lambda_t(1-F(x))}{\rho + \mu + \delta} dx$ where $\rho$ is the discount rate.

3. DATA
- Danish MEE (firm+worker IDs) data 1986-99.
- Wages (av. hourly wage in job held in Nov.).
- Labor market states (weekly basis): E, U or N.
- Experience is actual experience.
- Select: Males, age < 51, experience > 5 years.
- Stratify on education (9-11, 12, 13-18 years).

4. INDIRECT INFERENCE
Let $\theta$ be the structural parameter with true value $\theta_0$.

Step 1: Estimate auxiliary models on the data, [producing a vector of real moments $\beta = \beta_{true}(\theta_0)$].

Step 2: Simulate the structural model for given $\theta$ and estimate same auxiliary models on sim. data [producing a vector of sim. moments $\beta = \beta_{sim}(\theta)]$.

Step 3: Find $\theta$ that minimize $DIST(\beta_{true}(\theta), \beta_{sim}(\theta))$.

Parameters of reduced form models as moments:
- Duration model (Burdett and Mortensen, 1998)
- Wage eq. w/ 2-sided het. (Abowd et al 1999)
- Wage-growth eq. (within-job diff ed wage eq.)

5. RESULTS
Counter-factual analysis: Eliminating human capital accumulation.

Wage growth decomposition: The structural wage equation admits the a decomposition of period by period wage growth:

Using the estimated model we obtain the following decomposition of monthly wage growth:

6. CONCLUSION
Monthly wage growth can be decomposed into:
- Human capital effects
- Between job effects due to job search
- Within-job effects due to job search

Our structural model encompasses standard reduced form models of wage growth and dynamics, and we find that:
- Human capital is more important in the beginning of workers’ careers.
- Human capital’s importance for wage growth is increasing in education.
- Within-job search effects dominates between-job search effects.

Present shortcoming: We face some difficulties in fitting job-to-job transitions.

Work in progress: We are currently working on incorporating data on firm productivity and estimating the model on a longer panel with more frequent wage observations.