Comments on "Wage Bargaining with On-the-job Search: A Structural Econometric Model" by P. Cahuc, F. Postel-Vinay, and J.-M. Robin

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1. Introduction

- This is another very nice paper in a substantial saga by the authors.
- Its contribution is mainly methodological. They show how to estimate an equilibrium search model with between-firm competition and bargaining power.
- Postel-Vinay & Robin (2002) modelled between-firm competition. Now they add one parameter to capture bargaining power, but using a different empirical strategy.
- LFS data are used to estimate workers' mobility, and firm-level data to estimate marginal productivity and wages.
- The multi-stage estimation used in the paper is helpful for detecting the sources of identification of each parameter. Away from statistical orthodoxy, but with the ability to provide estimates whose credibility can be assessed.
- I will provide a summary of the paper, together with some comments focusing on the empirical strategy.

2. Basic setup

- There are type-ε workers and type-p firms. The unemployment rate is u. Both the unemployed and the employed sample firms from an exogenous distribution $F(p)$ at rates λ_0 and λ_1, respectively. The layoff rate is δ.
- There is a standard equilibrium relationship between inflow, outflow, and unemployment rate:

$$\lambda_0 u = \delta (1 - u) .$$

- The layoff rate can be estimated from the equilibrium condition using u and empirical exit rates from unemployment.

3. Estimating job mobility using data on job durations

- A worker only changes firms if he receives an offer from a more productive firm.
- Letting $L(p)$ be the *cdf* of firm types across workers, the stock of workers at a firm with productivity less than p is
$$L(p)(1-u).$$
- The outflow of this stock is $\left[\delta + \lambda_1 \overline{F}(p)\right] L(p)(1-u)$ and the inflow is $\lambda_0 F(p) u$. Equating them $L(p)$ satisfies
$$L(p) = F(p) / \left[1 + \kappa_1 \overline{F}(p)\right]$$
with $\kappa_1 = \lambda_1 / \delta$ (no. of job offers relative to job duration).
- The conditional density of $t_j \mid p$ is exponential whereas the marginal one is (Ridder & van den Berg, 2000):
$$\mathcal{L}(t) = (1+\kappa_1)(\delta/\kappa_1) \int_1^{1+\kappa_1} (1/r) e^{-\delta r t} dr.$$
- The idea is to get ML estimates of κ_1 and δ from $\mathcal{L}(t)$. Problems are that there may not be many complete job spells, or retrospective information may be unreliable.
- The link between $L(p)$ and $F(p)$ is the same as the one between the cross-sectional *cdf* of wages and the wage offer distribution in any partial job search model with on-the-job search (or in Burdett-Mortensen).
- Thus, all these models seem to imply the same distribution of job durations and the same κ_1.

4. Estimating firm marginal productivity values

- The estimated production equation is
$$\ln Y_{jt} = \ln \theta_j + \xi \ln (M_{ujt} + \alpha M_{sjt}) + \eta_{jt}$$
together with the assumption that $E_{t-1}\left(\eta_{jt}\right) = 0$ for a conditioning set that includes lagged M_u and M_s.
- An alternative assumption would be $E_{t-1}\left(e^{\eta_{jt}}\right) = 1$.
- Y_{jt} is value-added of firm j at t, M_{sjt} and M_{ujt} are the numbers of skilled and unskilled workers, $\ln \theta_j$ is a firm effect, and α is the skilled-unskilled productivity ratio.
- Separate five-year panel GMM estimates for 13 industries are obtained. With $\xi = 1$, firm marginal productivity values can be neatly associated with θ_j.
- It is unclear how estimates of the *cdf*s of p's in the population of firms and employed workers are obtained.
- One possibility is to get an empirical *cdf* of individual estimates of θ_j, which are noisy because the panel is short.
- An alternative is to infer the distribution of θ_j from the empirical *cdf*s of levels and first-difference residuals using an inversion method (Horowitz & Markatou, 1996).

5. Wage setting

- Let $U(x) = x$ be the instantaneous utility of income x; let V_0 be the lifetime utility of an unemployed worker (omitting dependence on ε for simplicity), and let $V(w, p)$ be lifetime utility when employed at a p-firm with wage w.

- An unemployed worker meeting a p-firm gets a wage $\phi_0(p)$, which solves
$$V(\phi_0(p), p) = V_0 + \beta [V(\varepsilon p, p) - V_0]$$
where εp is the marginal productivity of the (ε, p) match, $[V(\varepsilon p, p) - V_0]$ is the rent of the match, and $0 \leq \beta \leq 1$ measures the worker's bargaining power.

- An employed worker at a p-firm which meets a p'-firm with $p' > p$, changes firms and gets a wage $\phi(p, p')$ that solves
$$V(\phi(p, p'), p') = V(\varepsilon p, p) + \beta [V(\varepsilon p', p') - V(\varepsilon p, p)].$$

- The authors get a nice explicit expression for $\phi(p, p')$:
$$\phi(p, p') = \varepsilon \left(p - (1 - \beta) \int_p^{p'} \frac{\rho + \delta + \lambda_1 \overline{F}(r)}{\rho + \delta + \lambda_1 \beta \overline{F}(r)} dr \right).$$

- If an employed worker earning wage w at a p-firm meets a p'-firm with $p' < p$, the worker will eventually remain at the initial firm, but he may or may not get a wage increase depending on whether p' is above or below a threshold productivity value $q(w, p)$ which solves

$$\phi(q(w, p), p) = w.$$

- If $p' \leq q(w, p)$ nothing happens.

- If $q(w, p) < p' \leq p$ the worker gets a higher wage $\phi(p', p)$ and stays with his original firm. This higher wage is the result of price competition between the p and p' firms.

- The paper specifies an explicit strategic bargaining game that leads to the previous outcome, which is equivalent to representing the negotiation by a Nash rule in the presence of between-firm competition for workers.

- They also get an expression for the conditional mean wage given p:

$$E(w \mid p) = g(p; \alpha, \kappa_1, F, \sigma, \beta).$$

where $\sigma = \rho/(\rho + \delta)$.

6. Estimating the bargaining power parameter

- Firm-level (skill specific) average wages ($\overline{w}_{ujt}$ and $\overline{w}_{sjt}$) are taken as an empirical counterpart to $E(w \mid p)$, and β_u and β_s are estimated by nonlinear GLS minimizing
$$\left\|\overline{w}_{kjt} - g\left(\widehat{p}_j; \widehat{\alpha}_k, \widehat{\kappa}_{1k}, \widehat{F}_k, \sigma, \beta_k\right)\right\| \quad (k = u, s)$$
where the $\widehat{\alpha}_k$ come from the production equation, together with the $\widehat{p}_j$ for each firm and the $\widehat{F}_k$, which are calculated from the $\widehat{L}_k(p)$, the $\widehat{\kappa}_{1k}$ are estimated from the job duration data, and σ is fixed to some constant.

- These equations have no free intercept. It is unclear to what extent the variation in $\widehat{p}_j$ is responsible for the bargaining power estimates as opposed to the overall average level of skilled and unskilled wages.

- An alternative would be to obtain
$$E(w) = \int E(w \mid p)\, d\Gamma(p) \equiv \gamma(\alpha, \kappa_1, F, \sigma, \beta),$$
and simply get estimates of bargaining power from the solutions to
$$\overline{w}_k = \widehat{\gamma}_k\left(\widehat{\alpha}_k, \widehat{\kappa}_{1k}, \widehat{F}_k, \sigma, \beta_k\right) \quad (k = u, s).$$

- They find that between-firm competition is important but bargaining power, specially for unskilled workers, is quite low.

7. General comments

- A limitation of the theoretical framework is that they consider competition among firms for workers, but not competition among workers for firms, which may lead to underestimation of β.
- More generally, I find difficult to give β an empirical interpretation that goes beyond the intricacies of the model. In the theory it is just bilateral bargaining power between firm and worker, but is unrelated to union strength.
- A problem with this paper is that we cannot match worker mobility with firms so that we cannot observe worker-specific ladders of p's. Why not trying DADS despite its limitations? One could still use estimates of κ_1 from the LFS job duration data.
- Among the more general limitations, already acknowledged by the authors, I would mention:
  (a) Lack of human capital accumulation.
  (b) Lack of sorting (the distributions of worker and firm types are independent).
- Having got information on firm technologies it should be possible to distinguish the contributions to returns to experience from increased knowledge and from better technological matches.