Lecture 1: Job-to-Job Flows and Wage Dispersion

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IFS Master Class
October 25-26, 2007
London

Introduction: Mortensen (2003)

- Average wages paid by firms are disperse, persistent and correlated with size. (Davis and Haltiwanger (1991))
- The cross firm distribution of average wages paid stochastically dominates the distribution of wages offers (Jolivet, Postel-Viney, and Robin (2006).)
- Half of new hires in any month were already employed by another firm, 70% of separations in one month have a different employer in the next conditional on staying in the labor force. (Nagypal (2004).)
- Purpose: Present a structural empirical model that can explain these turnover facts. (Christensen et al. (2005) and Mortensen (2003).)

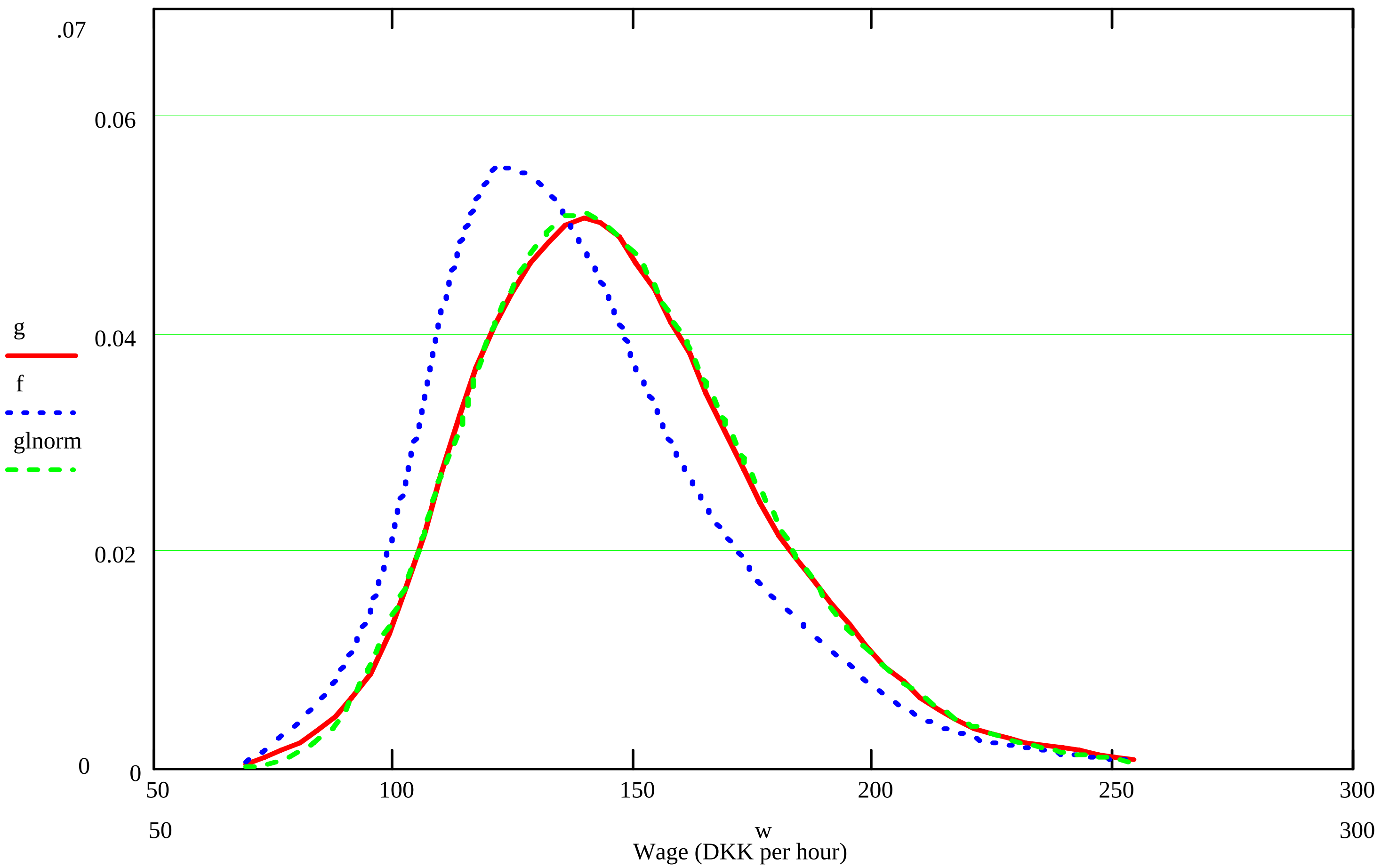
Danish IDA Data

- Observations (1994-1995) for all 113,525 privately owned firms with two or more employees on wages paid each worker, wage paid each new hire, total employment, number of stayers, and number hired from non-employment.
- Given average wage paid for each firm,

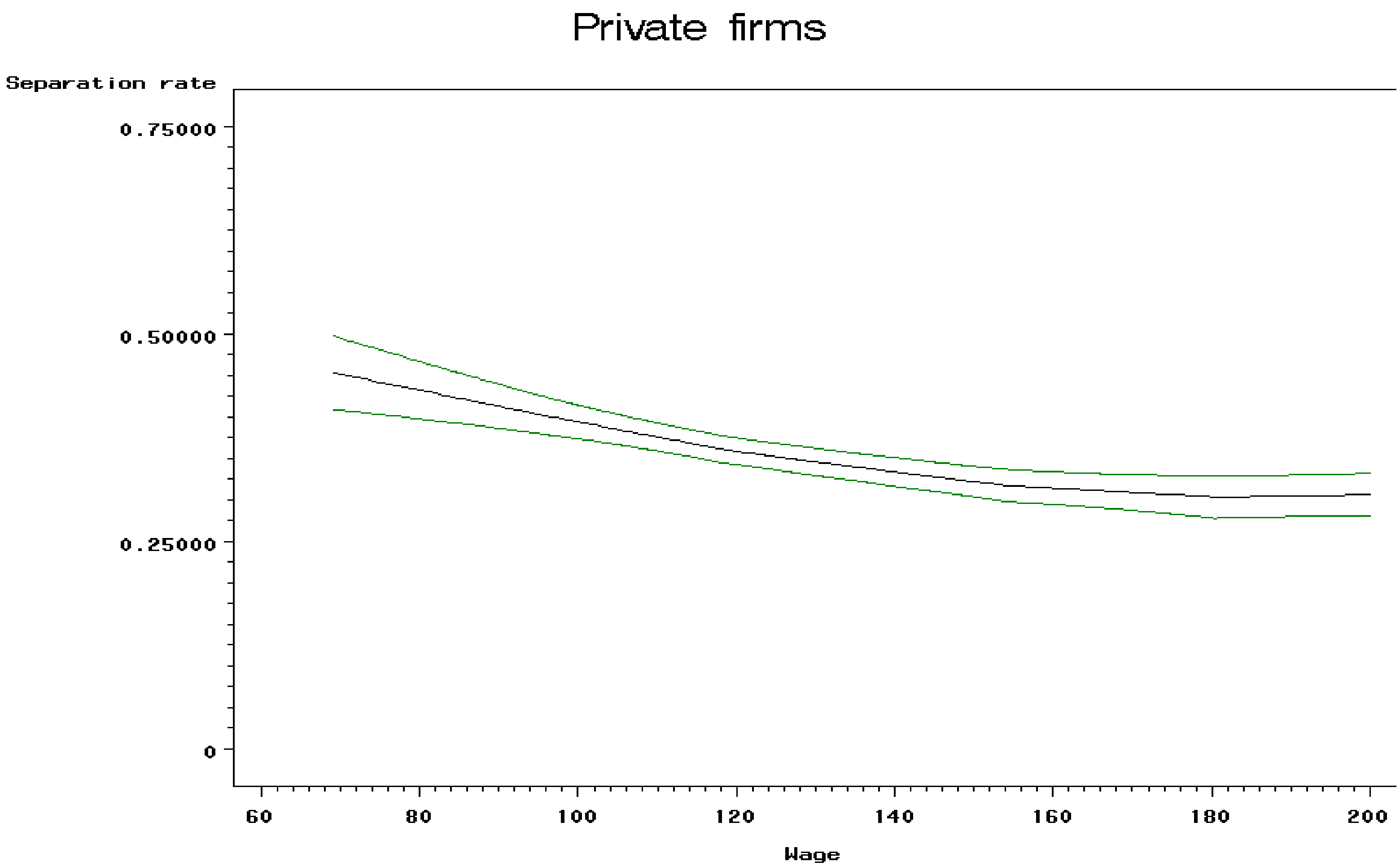
$$\overline{w}_j = \frac{1}{n} \sum_{i \in I_j} w_{ij}$$

- Wage offer cdf: $F(w)$ = fraction of new hired from non-employment by firms with $\overline{w} \leq w$
- Wage paid cdf: $G(w)$ = fraction of all workers employed by firms with $\overline{w} \leq w$.

Sample	Private	Managers	Salaried	Skilled	Unskilled
Sample Size (# of firms)	113,325	49,667	57,513	44,527	70,886
Min Wage	69	69	69	69	69
Max Wage	435	626	323	310	331
Median Offer	132	188	124	138	115
Mean Wage Offer	138	188	128	141	121
Std of Wage Offer	32	50	25	26	26
Median Wage Earned	142	198	131	141	121
Mean Wage Earned	146	198	133	144	126
Std of Wage Earned	32	48	25	26	28
Mean Size	13.36	6.20	6.22	5.94	7.81
Std of Size	125.84	45.19	70.25	28.09	64.50



IDA Offer (f), Wage (g), and Log Normal ($g\ln norm$) Density Functions



Firm Separation Rate and Wages

Worker Search Effort

- Value of employment at wage w solves

$$rW(w) = \max_{s\geq 0}\left\{ \begin{array}{c} w - c(s) + \lambda s \int_w^{\overline{w}} [W(x) - W(w)]dF(x) + \\ \delta_0(U - W(w)) + \delta_1 \int_R^{\overline{w}} [W(x) - W(w)]dF(x) \end{array} \right\}$$

where δ_0 is the job destruction and δ_1 is the exogenous reallocation rate.

- Value of unemployment solves

$$rU = rW(R) = \max_{s_0\geq 0}\left\{ b - c(s_0) + (\delta_1 + \lambda s_0) \int_R^{\overline{w}} [W(w) - W(R)]dF(w) \right\}$$

- The optimal effort strategy implies

$$s'(w) < 0 \text{ for } w \geq R,\ s_0 = s(R) \text{ and } R = b.$$

Monopsony Wage

- Given identical workers, acceptance probability and separation rate are respectively

$$h(w) = \frac{u[\delta_1 + \lambda s(R)] + (1-u)\left(\delta_1 + \lambda \int_R^w s(z)dG(z)\right)}{u[\delta_1 + \lambda s(R)] + (1-u)\left(\delta_1 + \lambda \int_R^{\overline{w}} s(z)dG(z)\right)}$$

$$d(w) = \delta + \lambda s(w)[1 - F(w)],\ \delta = \delta_0 + \delta_1$$

- Expected value to the employer of an applicant given productivity p is

$$V(p, w) = \frac{h(w)(p-w)}{r + d(w)}.$$

- Optimal (Budett-Mortensen (1998)) wage policy is

$$w(p) = \arg\max_w V(p, w) \Rightarrow w(\underline{p}) = R \text{ and } w'(p) > 0$$

Rent Sharing Wage

- Suppose that worker and employer bargain continuously over current output.
- In this case, the generalized Nash solution when separation as the threat point is

$$w(p) = \max_w (w - R)^\beta (p - w)^{1-\beta}$$

$$= R + \beta(p - R) \text{ and } w(\underline{p}) = R$$

where β represents worker "bargaining power".

- This is (close) but *not* the solution to the "value sharing" problem in Mortensen (2003) formalized as

$$\max_w (W(w) - U)^\beta V(p, w)^{1-\beta}.$$

Wage Distribution and Steady State

- As $w'(p) > 0$ in either case, the wage offer distribution is

$$F(w(p)) = \Gamma(p)$$

where $\Gamma : \left[\underline{p}, \overline{p}\right] \to [0,1]$ is the cross firm productivity c.d.f.

- The steady state unemployment rate u solves

$$\frac{u}{1-u} = \frac{\delta_0}{\delta_1 + \lambda s(R)}.$$

- The steady state wage earned cdf $G(w)$ solves

$$(\delta_0 + \delta_1(1 - F(w))G(w) + \lambda[1 - F(w)] \int_{\underline{w}}^{w} s(x)dG(x)$$

$$= (\delta_1 + \lambda s(R))F(w)\left(\frac{u}{1-u}\right) = \delta_0 F(w) \Rightarrow G(w) \leq F(w).$$

Labor Market Equilibrium

- Definition: Functions $s(w), w(p),$ and $G(w)$ that satisfy optimality and the steady state conditions.

Theorem (Mortensen (2003): A unique equilibrium exists given either monopsony or rent sharing.

- Although the general proof is complicated, the basic idea can be illustrated by (arbitrarily) assuming that $s(w) = s_0 = 1$ for all w and rent sharing.
- From the steady state conditions and $F(w(p)) = \Gamma(p)$, the equilibrium is

$$G(w(p)) = \frac{\delta_0 \Gamma(p)}{\delta_0 + (\delta_1 + \lambda)(1 - \Gamma(p))}$$

and

$$w(p) = b + \beta(p - b).$$

Estimation (Christensen (2005))

- Data: F and (w_i, n_i, n_i^s), $i = 1,..N$, where w_i is the (average wage paid), n_i = employment at date t, and n_i^s = the number of these employed at date $t+1$ for firm i.
- Given a power cost of search effort function, the optimal search intensity solves

$$c_w'(s(w)) = c_0 s(w)^{\frac{1}{\gamma}} = \lambda \int_w^{\overline{w}} \frac{[1-F(x)]dx}{r+d(w)}$$

and where

$$d(w) = \delta + \lambda s(w)[1-F(w)] \text{ and } s(R) = 1.$$

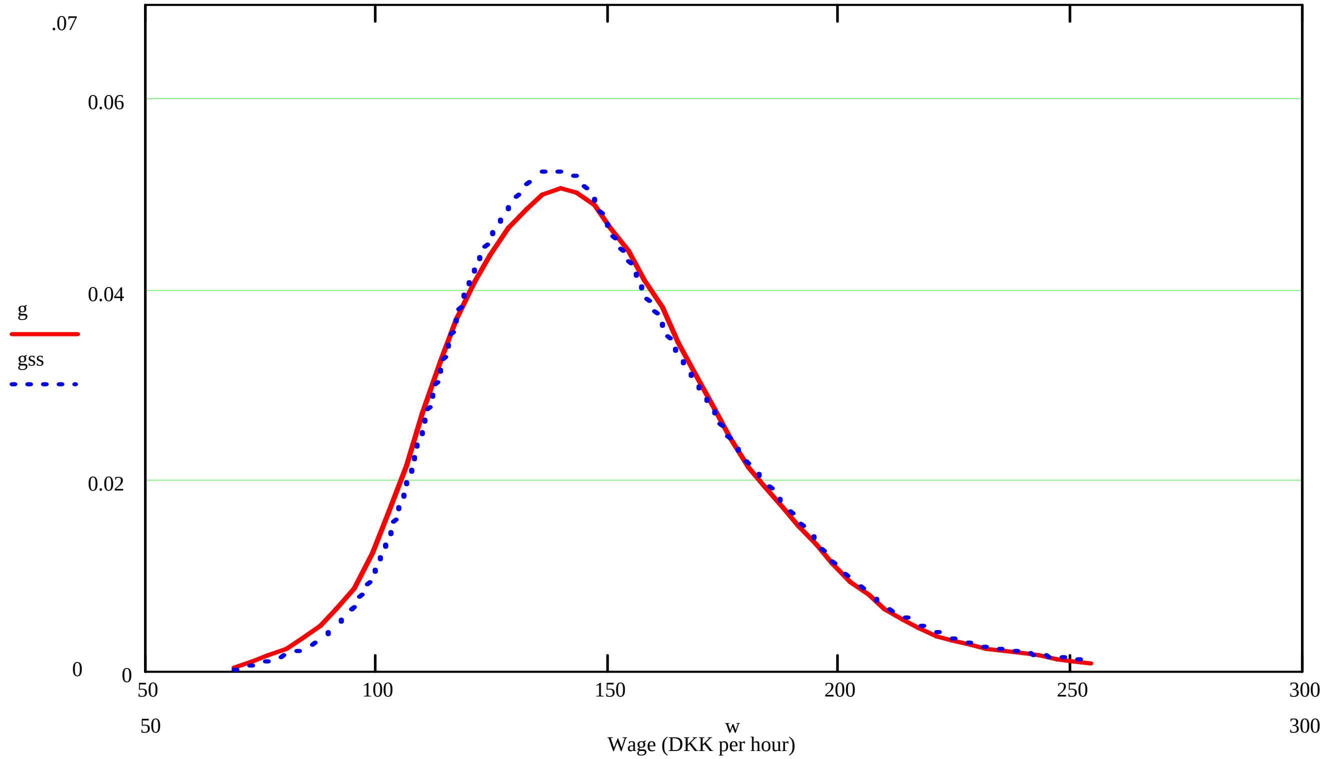
- As employment spells are exponential with hazard $d(w)$, the ML estimates for the full sample are

$$(\widehat{\delta}, \widehat{\lambda}, \widehat{\gamma}) = \arg\max \left\{ \sum_{i=1}^{N} \left(\begin{array}{c} (n_i - n_i^s)\ln(1-e^{-d(w_i)}) \\ -d(w_i)n_i^s \end{array} \right) \right\}$$

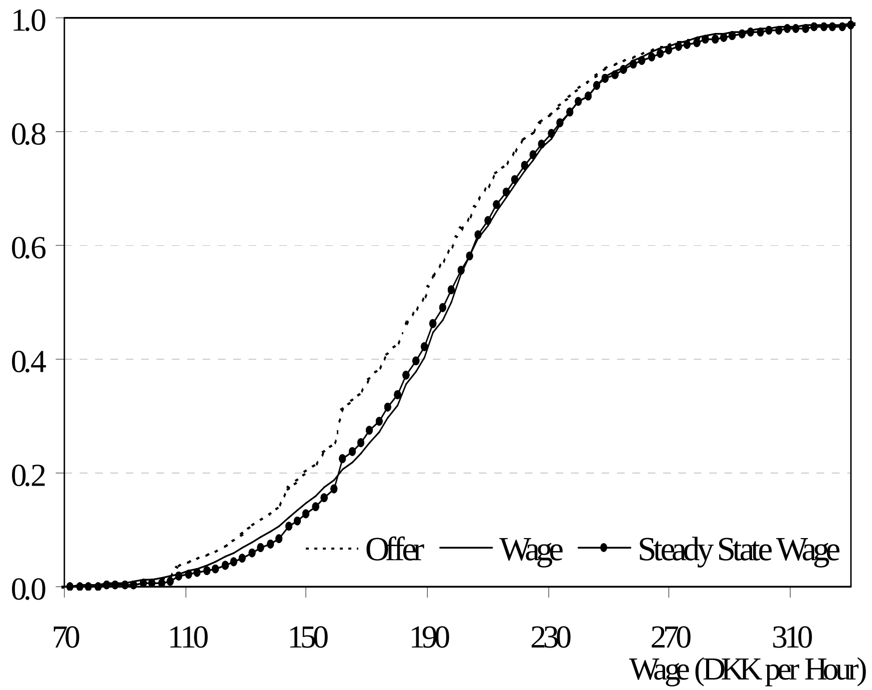
Results: Parameter Estimates (std errors)

Sample	Private	Managers	Salaried	Skilled	Unskilled
δ	0.2873	0.2162	0.2392	0.3007	0.3950
	(0.0007)	(0.0013)	(0.0014)	(0.0016)	(0.0018)
γ	1.1855	1.4919	1.0789	2.4390	0.7686
	(0.0198)	(0.0605)	(0.0365)	(0.1281)	(0.0319)
λ	0.5833	0.3211	0.4418	0.4585	0.4787
	(0.0055)	(0.0090)	(0.0089)	(0.0218)	(0.0080)

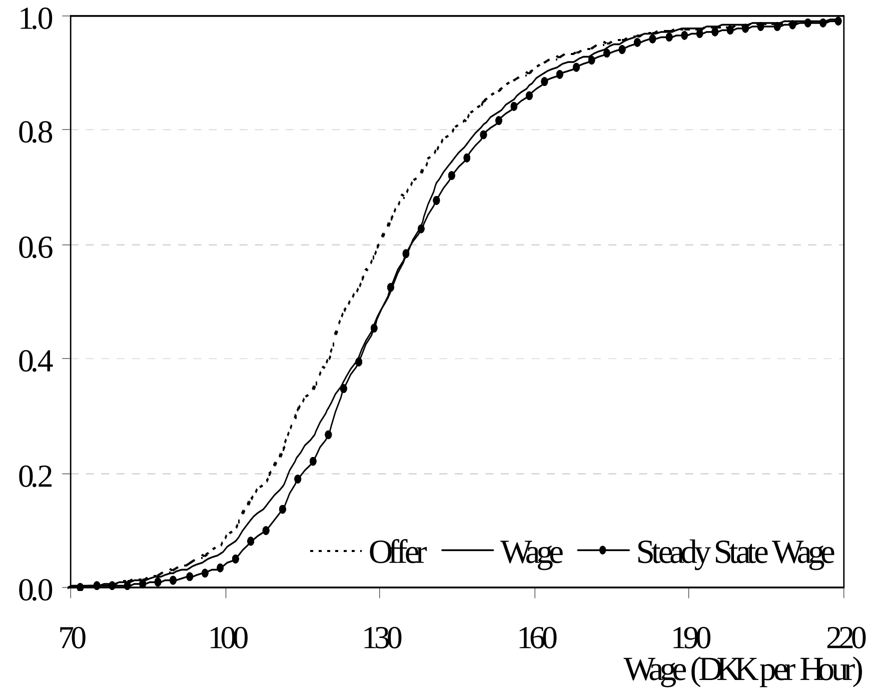
- Actual and Predicted SS $G'(w)$



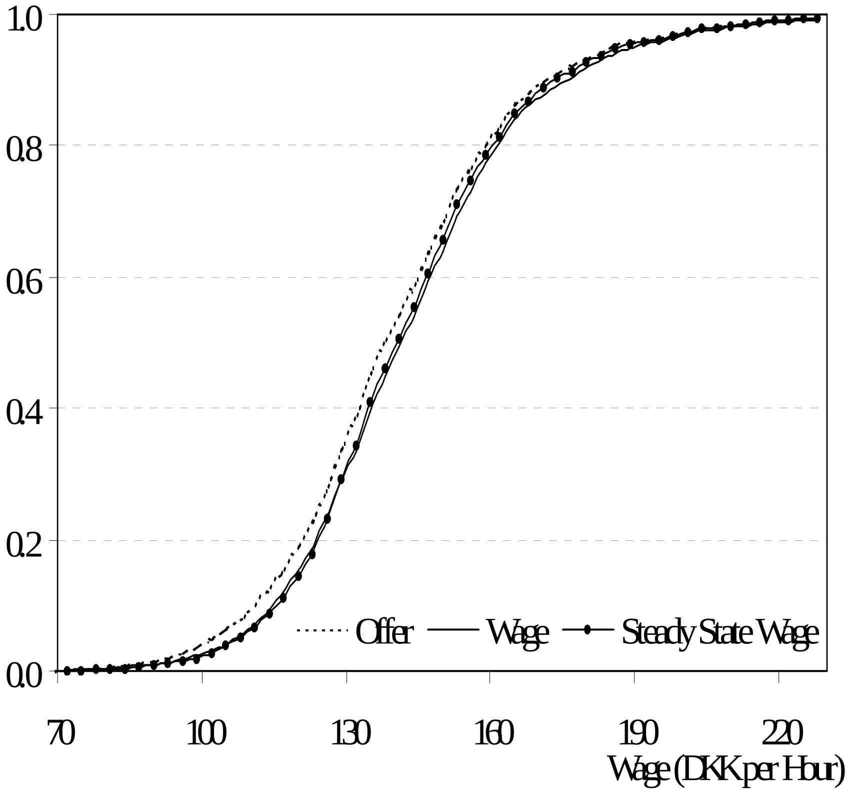
Actual (g) and Predicted (gss) Wage Densities



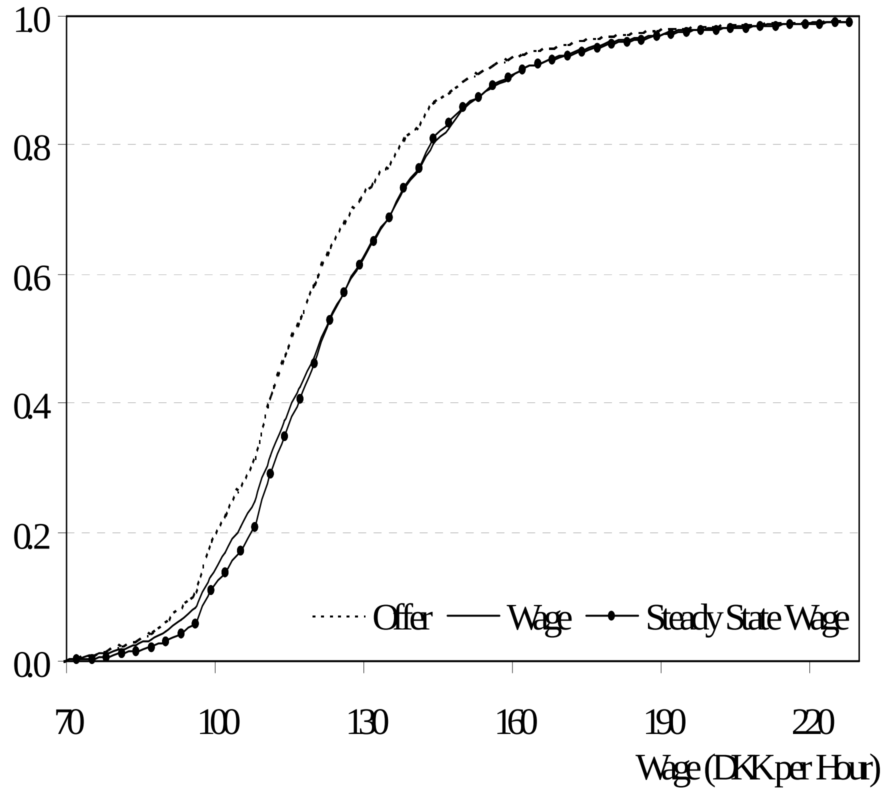
Managers CDFs



Salaried Workers CDFs



Skilled Workers CDFs

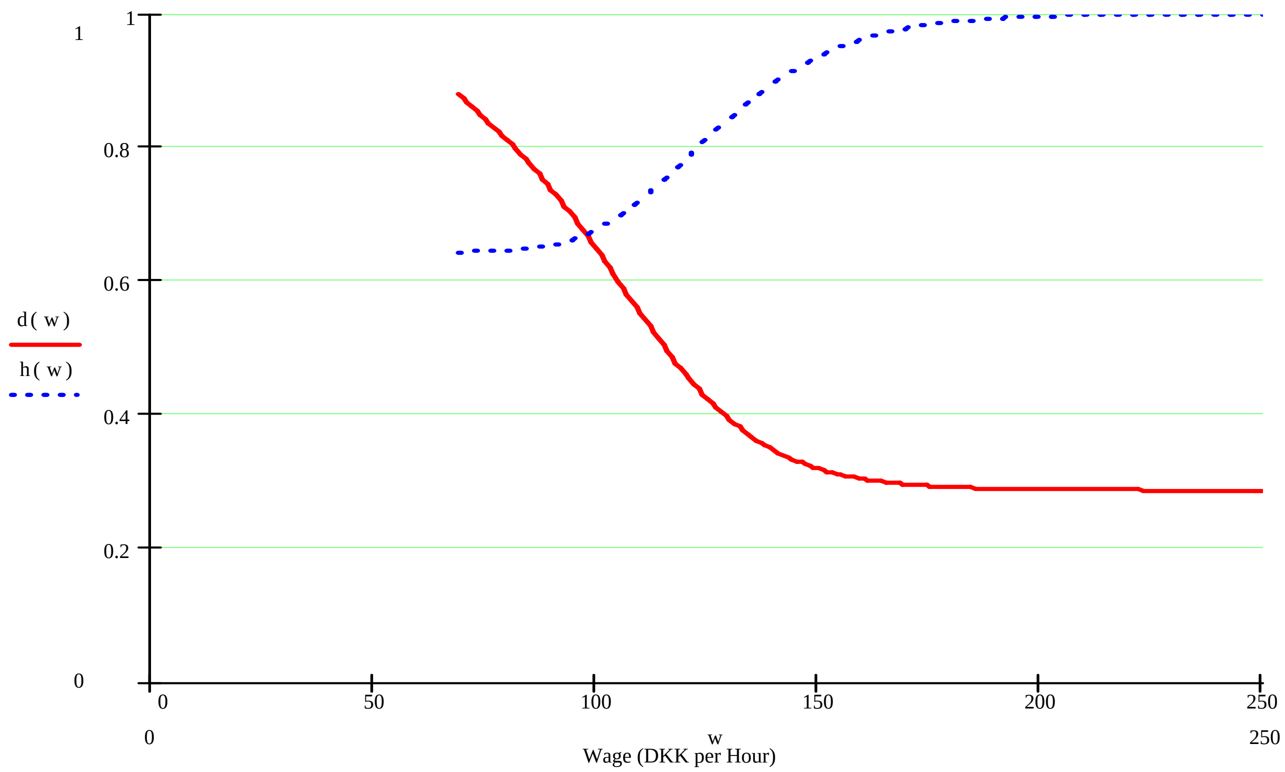


Unskilled Workers CDFs

(Wages in Danish Crowns per Hour)

Sample	Private	Managers	Salaried	Skilled	Unskilled
1st quantile of G	123.95	169.99	115.79	126.71	108.10
1st quantile of G^*	125.00	167.55	118.88	126.79	108.93
2d quantile of G	142.18	198.04	131.29	141.47	121.11
2d quantile of G^*	141.67	196.38	131.20	140.64	121.41
3d quantile of G	162.74	224.92	144.35	157.35	140.01
3d quantile of G^*	163.70	223.64	146.80	156.30	139.67

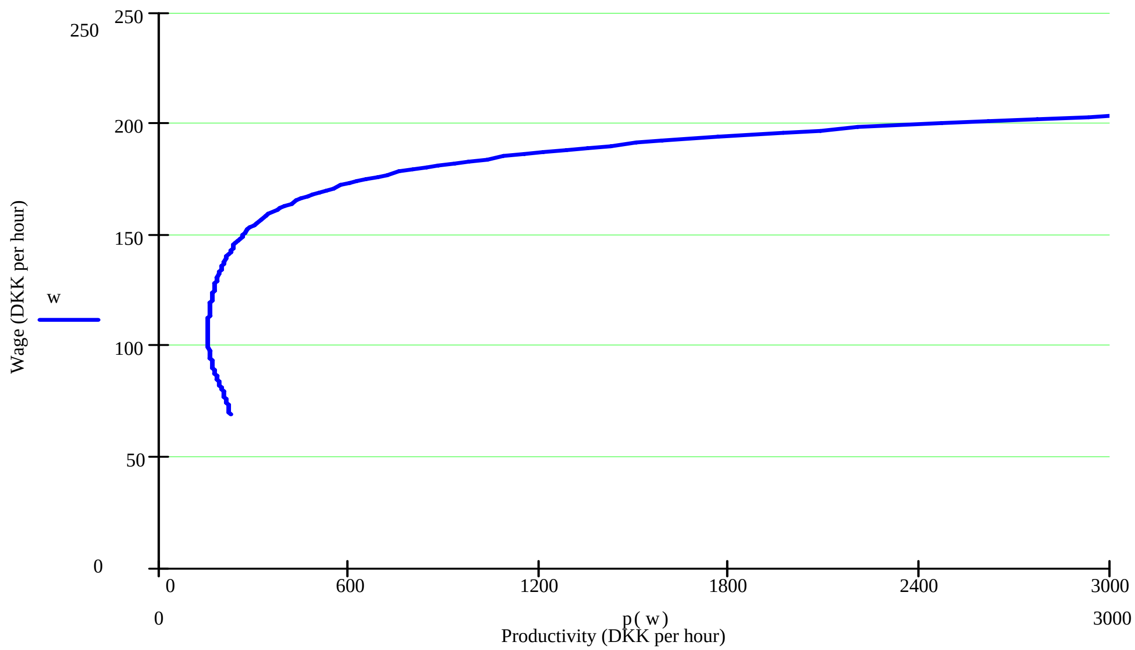
Implied Separation and Acceptance Rate



The Separation and Acceptance Probability Rates

Inferred Monopsony Policy

$$p(w) = w\left(1 + \frac{1}{\frac{wh'(w)}{h(w)} - \frac{wd'(w)}{r+d(w)}}\right).$$



Summary

- The Danish evidence supports the hypothesis that employed workers are motivated by differentials to move from lower to higher paying jobs.
- An on-the-job search model with endogenous choice of effort explains the difference between the distribution of wages offered by firms and the average wage paid. $(F(w) - G(w))$.
- Because the model implies that the supply of workers to the firm is very inelastic at high relative wages, simple rent sharing is more plausible than monopsony as a wage determination mechanism.

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