

# Contract Enforceability and The (In)Efficiency of Worker Turnover

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# Introduction

- **Job-to-job** transitions are large: e.g., Fallick and Fleischman (2004) estimate for the U.S. that 1.6% of the population goes from one job to another job from one month to the next.
- However, there has been limited attention in the literature to the question of the efficiency of **job-to-job** mobility decisions.
- Two reasons to consider the efficiency of job-to-job movements:
  - ▶ To help design labor market policies;
  - ▶ Modeling of on-the-job search is crucial to explain frictional wage dispersion (Hornstein et al., AER 2011).

# Introduction (Cont'd)

Explanations for job-to-job transitions fall into two main categories:

- **Learning** - Mobility decisions motivated by arrival of new information about **current** match:
  - ▶ Quality of a match is *ex ante* unknown and is learnt over time;
  - ▶ Jovanovic (JPE 1979, JPE 1984), Felli and Harris (JPE 1996);
- **Search and Matching** - Mobility decisions driven by information about a **new** (more profitable) match:
  - ▶ Search frictions mean that workers (and firms) follow reservation strategies and do not wait for the perfect match;
  - ▶ Diamond-Mortensen-Pissarides (DMP) and Burdett-Mortensen (BM) are canonical models.

# Introduction: This Paper

This paper combines the search and learning literatures and shows that:

- 1 The degree of enforceability of contracts is crucial for the **social** efficiency of job-to-job mobility decisions of workers:
  - ▶ Job-to-job mobility decisions are efficient when contracts are fully enforceable;
  - ▶ they are not when contracts are self-enforcing (unless workers have all the bargaining power), in which case there is **too little** mobility, even though mobility decisions are **privately efficient**;
- 2 A flat firing tax can restore efficiency, thereby **increasing** workers' mobility:
  - ▶ At odds with existing theoretical literature;
  - ▶ Can help explain mixed empirical results regarding the link between workers turnover and Employment Protection Legislations (EPL).

# Introduction: This Paper (Cont'd)

- Focus is on **social** (in)efficiency:
  - ▶ Employment contracts are the outcome of a bargaining game taking place **before** agents match;
  - ▶ Game is chosen to ensure that mobility decisions are **privately** (or jointly) efficient.
- Source of inefficiency with self-enforceable contracts:
  - ▶ An **endogenous incompleteness** of contracts that puts current and potential employers on different footings.
  - ▶ The value of a new match depends on the value of **subsequent** matches for the worker and self-enforceable contracts do not permit to capture the entire value of future matches.

# Introduction: Related Literature

- Efficiency of Match Turnover:
  - ▶ Mortensen (Bell 1978): Congestion externality;
  - ▶ Diamond and Maskin (JPE 1979): Private Contractual inefficiency;
  - ▶ Gautier, Teulings, and van Vuuren (ReStud 2008): Another congestion ext, "business-stealing" effect;
  - ▶ Kiyotaki and Lagos (JPE 2009): Composition externality.
- Models of investments that are subject to hold-up problems:
  - ▶ Examples include Grout (ECMA 1984), Acemoglu (JoLE 1997), Masters (IER 1998), Acemoglu and Shimer (IER 1999), Malcomson (JEL 1999)
  - ▶ The inefficiency lies in the incompleteness of contract that prevents agents from maximizing the joint, or private, surplus;
  - ▶ Moreover, the nature of the economic decision in this paper is different, for instance there is no sunk cost to be paid.

# Setup: Agents

- Time is continuous and the horizon is infinite.
- Workers:
  - ▶ Mass one of infinitely-lived and homogeneous workers, discount the future at rate  $r > 0$ ;
  - ▶ Flow utility of being unemployed is  $b \geq 0$ , and of being employed at wage  $w$  is  $u(w) = w$ .
- Firms:
  - ▶ Mass  $n$  of profit-maximizing and homogeneous firms;
  - ▶ Constant returns to labor production function: **no composition externalities**.

## Setup: Search and Matching

- Workers' search is random, and both unemployed and employed workers contact firms according to a Poisson process with parameter  $\alpha > 0$  - **no congestion externalities**.
- Jobs are experience goods:
  - ▶ the match-specific productivity index  $x$  is drawn from a known distribution with *cdf*  $F$  with support  $X = [\underline{x}, \bar{x}]$ ,  $\underline{x} \geq b$ ;
  - ▶ The productivity draw is learnt **after** a match is formed, but as soon as the match is formed.
- Matches are destroyed by some exogenous shock that follows an exponential distribution with parameter  $\delta > 0$ .



# Setup: Contracts

- Two contractual environments:
  - ▶ Contracts are **fully enforceable**: contracts must *ex ante* optimal, but necessarily *ex post*;
  - ▶ Contracts must be **self-enforcing**: contracts must be *ex ante* and *ex post* optimal.
  
- Contracts:
  - ▶ In the paper I consider general contracts with lump-sum payments and where wages can be contingent on the productivity of the match, on the tenure of the worker on the job, and on the contract of the worker in her previous match;
  - ▶ I here focus on the case of **Fixed-Wage Contracts (FWC)** where there are no lump-sums and where wages can be only contingent on the productivity of the match.

## Setup: Contract Determination Mechanism

- Contracts are the outcome of a strategic bargaining game between a worker and one or two firms, and
- Negotiations take place **before** the match specific productivity of a new match is learnt;
- Mechanism chosen to ensure **mobility decisions are privately efficient.**

# Setup: Bargaining Protocol

- 1 *In the first stage firms propose a contract to the worker.*
  - 1 *If the worker accepts a contract, bargaining is over;*
  - 2 *If she turns down all offers, she keeps her existing contract, if any, and the bargaining process reaches the second stage.*
- 2 *In the second stage the worker gets to propose a contract with probability  $\beta \in (0, 1)$  and firms get to propose with probability  $1 - \beta$ . In the latter case if the worker is employed then firms enter a Bertrand competition for the worker.*
  - 1 *If the worker and one firm agree on a contract, this contract agreed on governs the match between the two agents.*
  - 2 *If agreement is reached with two firms, then the worker picks her preferred contract.*
  - 3 *Otherwise the worker keeps her previous contract, if any, or stays unemployed.*

# Efficient Mobility Decision Rule

The Social Planner solves

$$\max \int_0^{\infty} e^{-rt} \left[ (1 - u_t) \times \int_{x \in X} x dG_t(x) + u_t \times b \right] dt,$$

subject to

$$\dot{u}_t = \delta(1 - u_t) - \alpha u_t,$$

and

$$\begin{aligned} (1 - u_t) \times \dot{G}_t(x) &= \alpha \left[ u_t + (1 - u_t) \int_{x' \in X} \sigma_{x'}^{sp} dG_t(x') \right] F(x) \\ &\quad - (1 - u_t) \left[ \delta G_t(x) + \alpha \int_{\underline{x}}^x \sigma_{x'}^{sp} dG_t(x') \right]. \end{aligned}$$

## Efficient Mobility Decision Rule (Cont'd)

The shadow values are

$$r\omega_u - \dot{\omega}_u = b + \alpha(\tilde{\omega} - \omega_u),$$

and

$$r\omega_x - \dot{\omega}_x = x + \alpha\sigma_x^{sp}(\tilde{\omega} - \omega_x) - \delta(\omega_x - \omega_u),$$

where

$$\tilde{\omega} \equiv \int_{x \in X} \omega_x dF(x).$$

Hence, the (stationary) efficient mobility policy  $\sigma^{sp}$  does not depend on  $G$  and is such that

$$\sigma_x^{sp} \begin{cases} = 1, & \text{if } \tilde{\omega} > \omega_x, \\ \in [0, 1], & \text{if } \tilde{\omega} = \omega_x, \\ = 0 & \text{otherwise.} \end{cases}$$

## Efficient Mobility Decision Rule (Cont'd)

- We thus get that

$$\sigma_x^{sp} \begin{cases} = 1 & , \text{ for } x < x^{sp}; \\ \in [0, 1] & , \text{ for } x = x^{sp}; \\ = 0 & , \text{ for } x > x^{sp}. \end{cases}$$

**Proposition 1:** *The steady-state efficient mobility cut-off  $x^{sp}$  is such that*

$$x^{sp} = x^e + \frac{\alpha}{r + \delta} \int_{x^{sp}}^{\bar{x}} (x - x^{sp}) dF(x),$$

*and it is unique.*

- Efficient cutoff is equal to expected value of a draw **plus** the option value of search.

# Equilibrium Mobility Decision: Workers' Value Functions

- Unemployed:

$$rU = b + \alpha(\widetilde{W}(b, b) - U),$$

- The value of employment:

$$\begin{aligned} rW_x(w) = & w + \alpha\sigma_x(w) \left[ \widetilde{W}(x, w) - W_x(w) \right] \\ & + \alpha(1 - \sigma_x(w)) \left[ W_x(\widetilde{w}_x(w)) - W_x(w) \right] \\ & - \delta[W_x(w) - U], \end{aligned}$$

# Equilibrium Mobility Decision: Firms' and Joint Value Functions

- Firms:

$$rJ_x(w) = x - w - \alpha(1 - \sigma_x(w)) [J_x(\tilde{w}_x(w)) - J_x(w)] - (\delta + \alpha\sigma_x(w)) J_x(w).$$

- Joint Value - Denoting by  $V = W + J$ ,

$$rV_x(w) = x + \alpha\sigma_x(w)(\tilde{W}(x, w) - V_x(w)) - \delta(V_x(w) - U).$$



## Eq. Mobility Decision with Full Enforceability: Optimal Contracts

**Lemma:** Let  $\tilde{V}$  be the value of all other new matches. A FWC  $w = (w_x)_{x \in X}$  is an optimal FWC with full enforceability if and only if it is such that  $W_x(w) = \tilde{V}$  for all  $x \leq x^*$ , where  $x^* \equiv r\tilde{V} + \delta(\tilde{V} - U)$ .

- Intuition: Optimal contracts are such that:
  - ▶ mobility decision is jointly optimal - move if and only if  $V_x \leq \tilde{V}$ .
  - ▶ the worker extracts the maximum possible from future employers - all productivities that lead the worker to move again must give her a value of  $\tilde{V}$ .

## Eq. Mobility Decision with full Enforceability: Bargaining

**Lemma:** (i) When an unemployed worker meets a firm, at the first round of bargaining the firm offers an optimal contract  $w^*(b)$  such that

$$\tilde{W}(b, b) = \int_{x \in X} W_x(w_x^*(b)) dF(x) = U + \beta(\tilde{V} - U),$$

and the worker accepts

(ii) When a worker employed with an optimal contract in a match with productivity  $x$  at wage  $w$  with joint value  $V_x$ , if  $x \leq x^*$ , so that  $\tilde{V} \geq V_x$ , the new firm offers the worker an optimal contract  $w^*(x)$  such that

$$\tilde{W}(x, w) = \int_{x' \in X} W_{x'}(w_{x'}^*(w)) dF(x') = \tilde{V},$$

and the worker accepts, while if  $x > x^*$ , so that  $\tilde{V} < V_x$ , the current employer offers the worker a contract with wage  $\tilde{w}(x, w)$  such that

$$W_x(\tilde{w}(x, w)) = \max\{W_x(w); \tilde{V}\} + \beta \left[ \max\{W_x(w); V_x\} - \max\{W_x(w); \tilde{V}\} \right]$$

and the worker accepts this offer.

## Eq. Mobility Decision with full Enforceability: Efficiency

- Previous lemma implies that

$$rV_x = x + \alpha\sigma_x(\tilde{V} - V_x) - \delta(V_x - U),$$

and therefore workers obtain a value of match greater than the joint value for productivities  $x < x^*$ .

**Proposition 2:** *When contracts are fully enforceable and restricted to FWC, the equilibrium mobility cut-off  $x^*$  is equal to the efficient mobility cut-off  $x^{SP}$  for all values of  $\beta \in (0, 1]$ .*

## Eq. Mobility Decision with Self-Enforcing Contracts

- A FWC  $\mathbf{w} = (w_x)_{x \in X}$  is self-enforcing if and only if  $J_x(w_x) \geq 0$  and  $W_x(w_x) \geq U$  for all  $x$ .

**Lemma:** A FWC  $w = (w_x)_{x \in X}$  is self-enforcing only if  $w_x \leq x$  for all  $x$ .

- *Ex post* incentive for firm to renege on contracts that yields a negative value, which decreases:
  - ▶ the *ex ante* joint value of a new match, and
  - ▶ the *ex post* joint value of matches for which the worker will quit whenever she can.
- Hence, the impact on efficiency of mobility decisions is not obvious.

## Eq. Mobility Decision with Self-Enforcing Contracts: Bargaining

**Lemma:** (i) When an unemployed worker meets a firm, at the first round the firm offers a self-enforcing FWC  $w(b) = (w_x(b))_{x \in X}$  such that

$$\widetilde{W}(b, b) = \int_{x \in X} W_x(w_x(b)) dF(x) = U + \beta(\widetilde{V} - U),$$

and the worker accepts.

(ii) When a worker employed in a match with productivity  $x$  at wage  $w$  with joint value  $V_x$  meets another firm, if  $\widetilde{V} \geq V_x$  the new firm offers the worker a self-enforcing FWC  $w(x)$  such that

$$\widetilde{W}(x, w) = \int_{x' \in X} W_{x'}(w_{x'}(x)) dF(x') = V_x + \beta(\widetilde{V} - V_x),$$

and the worker accepts, while if  $\widetilde{V} < V_x$  the current employer offers the worker the self-enforcing contract  $\widetilde{w}(x, w)$  such that

$$W_x(\widetilde{w}(x, w)) = \max\{W_x(w); \widetilde{V}\} + \beta[V_x - \max\{W_x(w); \widetilde{V}\}],$$

and the worker accepts.

## Eq. Mobility Decision with Self-Enforcing Contracts: Inefficiency

- Previous lemma implies that:

$$rV_x = x + \alpha\beta\sigma_x(\tilde{V} - V_x) - \delta(V_x - U).$$

**Proposition 3:** (i) *The equilibrium mobility cut-off with self-enforcing FWC  $x^*$  is such that*

$$x^* = x^e + \frac{\beta\alpha}{r + \delta} \int_{x^*}^{\bar{x}} (x - x^*) dF(x),$$

*and it is unique.*

(ii) *For all  $\beta \in [0, 1]$ ,  $x^* \leq x^{SP}$ , with strict inequality for  $\beta < 1$ , and  $\partial x^* / \partial \beta > 0$ .*

- Results generalize to contracts with lump-sums and tenure-dependent wages.

# Understanding the Inefficiency

- When contracts are fully enforceable, the set of contracts is **complete**:
  - ▶ There is **no limit to the liability** a contract imposes on an agent;
  - ▶ Current and potential employers can both offer workers all surplus until next unemployment spell.
- The inefficiency with self-enforcing contracts comes from the resulting **endogenous incompleteness** of contracts:
  - ▶ it creates an **asymmetry** in the positions of an incumbent and a poaching firms.
  - ▶ Current employer can offer all surplus until next unemployment spell, but potential employer cannot, for the worker will capture only a fraction  $\beta$  of surplus of any subsequent match.

# Fixing the Inefficiency

- Several possible policies: tax/subsidy on wage, firing tax, etc.
- Focus on a **flat firing tax** that a firm laying off a worker the firm is liable to pay to a third-party:
  - ▶ Simple;
  - ▶ Contrary to literature, it **increases** job mobility by rewarding "risk" taking.
- Consider a firing tax such that tax is  $\tau = (\tau(w))_{w \in \mathbb{R}^+}$ : as long as  $\tau(w) \geq -J_x(w)$  a firm is better off continuing the match than breaking it.



## Fixing the Inefficiency (Cont'd)

- The efficient mobility decision is obtained if workers receive the wage  $x^{sp}$  for all productivities  $x \leq x^{sp}$ .

- But then

$$J_x(x^{sp}) = \frac{x - x^{sp}}{r + \delta + \alpha},$$

which is negative, with strict inequality for all  $x < x^{sp}$ .

- A firing tax thus yields the efficient mobility decision if it is such that

$$\tau(x^{sp}) \geq \frac{x^{sp} - \underline{x}}{r + \delta + \alpha}.$$

- The rest of the firing tax rate schedule is indeterminate and thus a flat firing tax such that  $\tau(w) = \tau(x^{sp})$  for all  $w$  works. This means that if firms face a large enough fixed administrative or legal cost to firing a worker, then they would retain her.

## Concluding Remarks

- Worker turnover is much lower in continental Europe than in the U.S. or the U.K., although countries from continental Europe tend to have much stronger employment protection legislations (EPL) than the U.S. or the U.K.
- This evidence seems at odds with the impact that a firing tax has on worker flows in this paper.
- However, I have ignored the possibility of productivity draws too low to make a match viable → Pries and Rogerson (JPE 2005).
- This might explain why empirical studies have failed to reach unambiguous conclusions relative to the impact of EPL on labor turnover.