The Social Cost of a Dual Labor Market

G. Ragusa and P. Reichlin

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Older workers over-represented among employees with long-term contracts, unionized jobs, strong protections against unemployment risks.
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Young workers are over-represented among employees with fixed term, or temporary jobs, often belonging to less regulated sectors.

Older workers are over-represented among employees with long-term contracts, unionized jobs, and strong protections against unemployment risks.

Old workers are “insiders.”
Efficiency losses?
Efficiency losses?

- lower labor demand across all generations of workers
Efficiency losses?

- lower labor demand across all generations of workers
- misalignment of wages and productivity
Efficiency losses?

- lower labor demand across all generations of workers
- misalignment of wages and productivity
- lower young workers’ wages and participation
Efficiency losses?

- lower labor demand across all generations of workers
- misalignment of wages and productivity
- lower young workers’ wages and participation

 Convincing arguments for reducing employment protection and decentralizing wage bargaining?
Strong opposition from trade unions and more senior employees
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Opposition to labor market reforms may be even stronger if young workers see the higher uncertainty and lower wages that they get on the market as a temporary condition (necessary for completing a transition to a more stable employment and a higher expected wage when they will be older)
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- higher transfers (pensions or unemployment subsidies) to old workers
Is there a labor market reform that, at the same time, can

- increase efficiency, by reducing firing costs,
- Pareto improve (making old workers at least as well off)?

The conjecture is that this reform requires

- higher transfers (pensions or unemployment subsidies) to old workers
- financed by an increase in young workers’ wages and labor participation.
Empirical evidence

Most of the empirical literature studies the effect of Employment Protection Legislation (EPL) on employment. Mainly cross-country studies. They (generally) find that EPL have a negative effect on the stock of employed and unemployed, Lazear(1990), Grubb & Wells (1993), Di Tella & MacCulloch (1998), Kugler & St-Paul (2000), Belot & van Ours (2001). A negative effect on inflows and outflows. An effect on the composition of employment and unemployment, with higher unemployment rates for the young, OECD (2004).
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- They (generally) find that EPL have
  2. a **negative** effect on inflows and outflows
  3. an effect on the composition of employment and unemployment, with higher unemployment rates for the young, OECD (2004).
There are few studies on the effect of EPL on wages and productivity:

1. Autor et al. (2007)
   - wrongful discharge protection reduced labor productivity (US data)

   - lower protection $\implies$ lower wage growth (Portugal)

   - additional month of dismissal notice increases wages (Netherland)
A single consumption good, $x$, produced at all periods
A single consumption good, \( x \), produced at all periods can be consumed or stored for one period only.
The Model

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Any amount, $k$, of the good stored at time $t$ generates $Rk$ units in $t + 1$, with $R > 1$. 
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Production Function $x_t = f(h_t)$
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Any amount, $k$, of the good stored at time $t$ generates $Rk$ units in $t+1$, with $R > 1$

Production Function \[ x_t = f(h_t) \]

$h = \text{amount of (young + old) labor in efficiency units}
The Model (cont.)

Every period, $t$, a continuum of mass 1 ex-ante identical individuals are born, each one living for two periods, $t$ and $t+1$. Labor supply of a young worker is elastic. Old workers supply a unit of labor inelastically, but their labor efficiency is subject to an exogenous shock. Old workers' labor efficiency $\tilde{e} \in \{e_L, e_H\}$, with prob. $\mu$, $1 - \mu = \mu e_L + (1 - \mu)e_H$.
Every period, $t$, a continuum of mass 1 ex-ante identical individuals are born, each one living for two periods, $t$ and $t + 1$. 

Labor supply of a young worker is elastic. Old workers supply a unit of labor inelastically, but their labor efficiency is subject to an exogenous shock.

Old workers' labor efficiency $\tilde{e} \in \{e_L, e_H\}$, with probability $\mu$, $1 - \mu$,

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- Old workers supply a unit of labor inelastically, but their labor efficiency is subject to an exogenous shock

- Old workers’ labor efficiency \( \tilde{e} \in \{e^L, e^H\} \), with prob. \( \mu, 1 - \mu \)
Every period, $t$, a continuum of mass 1 ex-ante identical individuals are born, each one living for two periods, $t$ and $t+1$

Labor supply of a young worker is elastic

Old workers supply a unit of labor inelastically, but their labor efficiency is subject to an exogenous shock

Old workers’ labor efficiency $\tilde{e} \in \{e^L, e^H\}$, with prob. $\mu, 1-\mu$

$$e = \mu e^L + (1-\mu) e^H \quad h = n^y + e n^o$$
The Model (cont.)

Old worker hired when young in firm $j$ cannot move to firm $j'$. He faces the options of staying in firm $j$ or being dismissed; old workers' wage, $w_{ot}$, and employment, $(n_{ot}, n_{yt})$, set through efficient bargaining between firm and old workers; wage contracts cannot be made contingent on the old workers' efficiency shock (unobservable).
The Model (cont.)

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Old worker hired when young in firm $j$ cannot move to firm $j'$. He faces the options of staying in firm $j$ or being dismissed;

Old workers’ wage, $w_t^o$, and employment, $(n_t^o, n_t^y)$ set through efficient bargaining between firm and old workers;
Old worker hired when young in firm $j$ cannot move to firm $j'$. He faces the options of staying in firm $j$ or being dismissed;

Old workers’ wage, $w_t^o$, and employment, $(n_t^o, n_t^y)$ set through efficient bargaining between firm and old workers;

Wage contracts cannot be made contingent on the old workers’ efficiency shock (unobservable)
The Model (cont.)

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The Social Cost of a Dual Labor Market
Fired old workers retire and get compensation $T$, financed through a per-unit of wage income tax rate, $\tau$, so as to balance the government budget every period.
The Model (cont.)

- Fired old workers retire and get compensation \( T \), financed through a per-unit of wage income tax rate, \( \tau \), so as to balance the government budget every period.

- We fix \( \tau \) and derive \( T \) endogenously from balanced budget constraint.
Fired old workers retire and get compensation $T$, financed through a per-unit of wage income tax rate, $\tau$, so as to balance the government budget every period.

We fix $\tau$ and derive $T$ endogenously from balanced budget constraint.

Hence, when evaluating effect of changing $\gamma$, $T$ is among the variables affected.
The Social Cost of a Dual Labor Market

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Young indiv. welfare at birth:

\[ d_{t+1} u(c^u_{t+1}) + (1 - d_{t+1}) u(c^e_{t+1}) - V(l_t) \]
The Model (cont.)

Young indiv. welfare at birth:

\[ d_{t+1} u(c^u_{t+1}) + (1 - d_{t+1}) u(c^e_{t+1}) - V(l_t) \]

- \( d_{t+1} = (n^\gamma_t - n^\alpha_{t+1}) / n^\gamma_t \) = lay-off probability when old
Young indiv. welfare at birth:

\[ d_{t+1}u(c_{t+1}^u) + (1 - d_{t+1})u(c_{t+1}^e) - V(l_t) \]

- \( d_{t+1} = (n_t^\gamma - n_{t+1}^\circ) / n_t^\gamma \) = lay-off probability when old
- \( c^u = \) cons. when unemployed
Young indiv. welfare at birth:

\[ d_{t+1}u(c^u_{t+1}) + (1 - d_{t+1})u(c^e_{t+1}) - V(l_t) \]

- \( d_{t+1} = \frac{n^y_t - n^o_{t+1}}{n^y_t} \) = lay-off probability when old
- \( c^u = \) cons. when unemployed
- \( c^e = \) cons. when employed
Young individ. welfare at birth:

\[ d_{t+1} u(c_{t+1}^u) + (1 - d_{t+1}) u(c_{t+1}^e) - V(l_t) \]

- \( d_{t+1} = \frac{n_t^Y - n_{t+1}^O}{n_t^Y} \) = lay-off probability when old
- \( c^u = \) cons. when unemployed
- \( c^e = \) cons. when employed
- \( l = \) labor supply
The Model (cont.)

Motivation
The Model
Optimal Contracts
Comparative Statics
Welfare
Empirical Evidence

Budget constraint:
\[ p_t \theta_t + k_t = w_y(t)(1 - \tau)l_t \]

No arbitrage:
\[ R_{t+1} = R_t = \pi_{t+1} + p_{t+1} \]

Consumptions (under no arbitrage):
\[ c_{u,t+1} = Rw_y(t)(1 - \tau)l_t + T_{t+1} \]
\[ c_{e,t+1} = Rw_y(t)(1 - \tau)l_t + w_{o,t+1}(1 - \tau) \]

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The Social Cost of a Dual Labor Market
The Model (cont.)

Budget constraint: \[ p_t \theta_t + k_t = w_t^y (1 - \tau) l_t \]
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No arbitrage: \[ R_{t+1} = R = \frac{\pi_{t+1} + p_{t+1}}{p_t} \]
The Model (cont.)

Budget constraint: \[ p_t \theta_t + k_t = w_t^Y (1 - \tau) l_t \]

No arbitrage: \[ R_{t+1} = R = \frac{\pi_{t+1} + p_{t+1}}{p_t} \]

Consumptions (under no arbitrage):

\[ c^u_{t+1} = R w_t^Y (1 - \tau) l_t + T_{t+1} , \]
\[ c^e_{t+1} = R w_t^Y (1 - \tau) l_t + w_{t+1}^o (1 - \tau) \]
The Model (cont.)

Motivation

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Indiv. optimization:

$V_l(t) = R_w y_t(1 - \tau)(d_t + 1)u_c(1 + 1) + (1 - d_t + 1)u_e(1 + 1)$

Labor market eq. (for young):

$n_y(t) = l_t$

Capital market eq.:

$p_t + k_t = w_y(l_t + w_o(1 - d_t - 1))$

Government balanced budget condition:

$T_t d_t l_t - 1 = \tau(w_y l_t + w_o(1 - d_t - 1))$

if $d_t > 0$

$T_t = \tau = 0$ if $d_t = 0$

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The Social Cost of a Dual Labor Market
The Model (cont.)

- Indiv. optimization:

\[ V'(l_t) = R w^y_t (1 - \tau) (d_{t+1} u'(c^u_{t+1}) + (1 - d_{t+1}) u'(c^e_{t+1})) \]
The Model (cont.)

- Indiv. optimization:
  \[ V'(l_t) = R w^y_t (1 - \tau) (d_{t+1} u'(c_{t+1}^u) + (1 - d_{t+1}) u'(c_{t+1}^e)) \]

- Labor market eq. (for young):
  \[ n^y_t = l_t \]
The Model (cont.)

- Indiv. optimization:
  \[ V'(l_t) = Rw^y_t (1 - \tau) \left( d_{t+1}u' (c^u_{t+1}) + (1 - d_{t+1})u' (c^e_{t+1}) \right) \]

- Labor market eq. (for young):
  \[ n^y_t = l_t \]

- Capital market eq.
  \[ p_t + k_t = w^y_t (1 - \tau)l_t \]
The Model (cont.)

- Indiv. optimization:
  \[ V'(l_t) = Rw_t^y (1 - \tau) (d_{t+1} u'(c_{t+1}^u) + (1 - d_{t+1}) u'(c_{t+1}^e)) \]

- Labor market eq. (for young):
  \[ n_t^y = l_t \]

- Capital market eq.
  \[ p_t + k_t = w_t^y (1 - \tau) l_t \]

- Government balanced budget condition
  \[ T_t d_t l_{t-1} = \tau (w_t^y l_t + w_t^o (1 - d_t) l_{t-1}) \quad \text{if} \quad d_t > 0 \]
  \[ T_t = \tau = 0 \quad \text{if} \quad d_t = 0 \]
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Optimal Contracts

Short-run profit at time $t$:

$$\pi_t = f(n_y t + e n_o t) - w y t n_y t - w o t n_o t - c(n_y t - 1 - n_o t)$$

Ass: $c(n_y t - 1 - n_o t) = \gamma^2 (\max\{0, n_y t - 1 - n_o t\})^2$.

Long-run profit at time $t$:

$$\Pi(n_y t - 1) = \infty \sum_{k=0}^{\beta k} \pi_t + k$$

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The Social Cost of a Dual Labor Market
Optimal Contracts

Short-run profit at time $t$

$$\pi_t = f(n_t^Y + e n_t^o) - w_t^Y n_t^Y - w_t^o n_t^o - c(n_t^Y - n_t^o)$$
Optimal Contracts

Short-run profit at time $t$

$$\pi_t = f(n^y_t + en^o_t) - w^y_t n^y_t - w^o_t n^o_t - c(n^y_{t-1} - n^o_t)$$

Ass:

$$c(n^y_{t-1} - n^o_t) = \frac{\gamma}{2} \left(\max\{0, n^y_{t-1} - n^o_t\}\right)^2.$$
Optimal Contracts

Short-run profit at time $t$

$$\pi_t = f(n_t^y + e\eta_t) - w_t^y n_t^y - w_t^o n_t^o - c(n_{t-1}^y - n_t^o)$$

Ass:

$$c(n_{t-1}^y - n_t^o) = \frac{\gamma}{2} \left( \max\{0, n_{t-1}^y - n_t^o\} \right)^2.$$ 

Long-run profit at time $t$

$$\Pi(n_{t-1}^y) = \sum_{k=0}^{\infty} \beta^k \pi_{t+k},$$
Chose
\[
\begin{align*}
{n_y} + k, \quad \infty_{k=0}
\end{align*}
\]
so as to maximize \(\Pi(n_{yt} - 1)\) subject to
\[
\frac{d}{dt}u(c_u) + (1 - \frac{d}{dt})u(c_e) \geq \bar{W}_{t-1},
\]
Assumption \(\bar{W}_{t-1} = (1 + \eta)u(c_u), \eta > 0\).
Chose \( \{ n_{t+k}^Y, n_{t+k}^O, w_{t+k}^O \}_{k=0}^\infty \) so as to maximize \( \Pi(n_{t-1}^Y) \) subject to

\[
d_t u(c_t^u) + (1 - d_t) u(c_t^e) \geq \bar{W}_t^{t-1},
\]
Optimal Contracts (cont.)

Chose \( \{ n_{t+k}^y, n_{t+k}^o, w_{t+k}^o \}_{k=0}^{\infty} \) so as to maximize \( \Pi(n_{t-1}^y) \) subject to

\[
d_t u(c_t^u) + (1 - d_t) u(c_t^e) \geq \bar{W}^{t-1},
\]

Assumption

\( \bar{W}^{t-1} = (1 + \eta) u(c_t^u), \eta > 0. \)
Optimal Contracts

First Order Conditions:

\[ f'(ht) = \frac{\beta \gamma}{ny_{t}} + \frac{\xi_{t}}{ny_{t}} \geq \frac{\omega_{t}}{ny_{t}} - \gamma_{dt} - 1 - \xi_{t} \]

where

\[ \xi_{t} = u(c_{et}) - u(c_{ut})(1 - \tau)u'(c_{et}) \]

Value of Particip.
First Order Conditions:

\[ f'(h_t) = w_t^Y + \beta \gamma d_{t+1} n_t^Y \]

\[ ef'(h_t) \geq w_t^o - \gamma d_t n_t^{Y-1} - \xi_t \]

where \( \xi_t = \frac{u(c_t^e) - u(c_t^u)}{(1 - \tau)u'(c_t^e)} \) Value of Particip.
Stationary Optimal Contracts

Proposition

A stationary contract is characterized by the following form:

\[ f'(h_t) = w + \beta \gamma d_t n_y - 1, \]

where

\[ d_t = \max \{ w - \xi_t - ew, 0 \}, \]

\[ \lambda = 1 + e^{\beta} \]

and \( h_t = n_y + eno \).
Proposition

A stationary contract is characterized by the following foc:

\[ f'(h_t) = w_t^y + \beta \gamma d_t n_{t-1}^y, \]

\[ d_t = \max \left\{ \frac{w_t^o - \xi_t - e w_t^y}{\gamma \lambda n_{t-1}^y}, 0 \right\}, \]

where \( \lambda = 1 + e\beta \) and \( h_t = n_t^y + en_t^o \).
Stationary Optimal Contracts

Define $\omega_t$ as implied reservation wage when old workers are fully employed:

$$u(R(1-\tau)y_t-1-1+(1-\tau)\omega_t)=\bar{W}_t-1$$
Define $\widetilde{w}_t^o$ as implied reservation wage when old workers are fully employed:

$$u \left( R(1 - \tau)w_{t-1}^y l_{t-1} + (1 - \tau)\widetilde{w}_t^o \right) = \widetilde{W}^{t-1}$$
Stationary Optimal Contracts

Proposition

Furthermore, if $el > T_t/(1 - \tau)$ or $\bar{w}_t \leq el + \xi_t$, then,

$$w_t = \bar{w}_t, d_t = 0.$$  

If $el < T_t/(1 - \tau)$ and $\bar{w}_t > el + \xi_t$, then,

$$w_t \in (\bar{w}_t, el + \xi_t), d_t \in [0, 1).$$
Proposition

Furthermore,

(FE) if either $e w_t^y \geq T_t/(1 - \tau)$ or $\bar{w}_t^o \leq e w_t^y + \bar{\xi}_t$, then,

$$w_t^o = \bar{w}_t^o, \quad d_t = 0.$$ 

(UE) If $e w_t^y < T_t/(1 - \tau)$ and $\bar{w}_t^o > e w_t^y + \bar{\xi}_t$, then,

$$w_t^o \in (\bar{w}_t^o, e w_t^y + \bar{\xi}_t), \quad d_t \in [0, 1).$$
Comparative Statics

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Proposition

When UE holds, \( w_t \), \( d_t \), and \( n_t \) are decreasing functions of \( y_t \) and \( \gamma \).

Notice that:

\[
\frac{\partial}{\partial w_t} (w_t - \xi_t) = -(1 - \tau) \xi_t \sigma_t < 0
\]

\( \sigma_t = -\frac{u''(c_e)}{u'(c_e)} \)

Absolute Risk Aversion

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The Social Cost of a Dual Labor Market
Proposition

When UE holds, $w_t^o$, $d_t$ and $n_t^y$ are decreasing functions of $w_t^y$ and $\gamma$. 

Notice that:

$$\frac{\partial}{\partial w_t^o} (w_t^o - \xi_t) = - (1 - \tau) \xi_t \sigma_t < 0$$

$$\sigma = - \frac{u''(c)}{u'(c)}$$

Absolute Risk Aversion
Comparative Statics

**Proposition**

*When UE holds, $w^o_t$, $d_t$ and $n^y_t$ are decreasing functions of $w^y_t$ and $\gamma$.*

Notice that:

$$ \frac{\partial}{\partial w^o_t}(w^o_t - \xi_t) = -(1 - \tau)\xi_t\sigma_t < 0 $$

$$ \sigma = -u''(c^e)/u'(c^e) \quad \text{Absolute Risk Aversion} $$
$w^\circ$ up implies $d$ down and $U^\circ > Res. Utility$. Firms can lower $w^\circ$
\( \gamma \) up implies \( d \) down and \( U^\circ > \text{Res. Utility.} \)

Firms can lower \( w^\circ \)

\( \text{Max } d \text{ from particip.} \)

\( d \text{ from FOC} \)
Proposition

When UE holds, \( w \) is increasing in \( T \) and \( dt \) is increasing in \( T \) if \( \sigma_t = 0 \) (risk neutrality).
**Proposition**

*When UE holds,*

- $w_t^o$ *is increasing in* $T_t$,
- $d_t$ *is increasing in* $T_t$ *if* $\sigma_t = 0$ *(risk neutrality)*,
The Model

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Welfare

Empirical Evidence

**Motivation**

**Optimal Contracts**

**Welfare**

Empirical Evidence

\[ T \text{ up implies value of participation, } \xi, \text{ down, } \Rightarrow d \text{ up} \]

Also: max \(d\) to keep workers in goes down \(\Rightarrow\) Firms must offer higher \(w^*\) (effect on \(d\) is ambiguous)

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The Social Cost of a Dual Labor Market
Demand for Labor

A rise in $d_t$ has two opposing effects:

**Cost Effect:** a higher $d_t$ reflects a higher (expected) firing cost ⇒ reduces demand for labor.

**Composition Effect:** a higher $d_t$ increases $n_y^{t-1}$ as more young are needed to replace old.

\[
\begin{align*}
    n_y^{t} = (f')^{-1}(w_y^{t} + \beta \gamma d_t n_y^{t-1}) - (1 - d_t) e n_y^{t-1}
\end{align*}
\]
Demand for Labor

\[ n^y_t = (f')^{-1} \left( w^y_t + \beta \gamma d_t n^y_{t-1} \right) - (1 - d_t)en^y_{t-1} \]
Demand for Labor

\[ n_t^\gamma = (f')^{-1} \left( w_t^\gamma + \beta \gamma d_t n_{t-1}^\gamma \right) - (1 - d_t) en_{t-1}^\gamma \]

A rise in \( d_t \) has two opposing effects
Demand for Labor

\[ n_t^y = (f')^{-1} \left( w_t^y + \beta \gamma d_t n_{t-1}^y \right) - (1 - d_t) en_{t-1}^y \]

A rise in \( d_t \) has two opposing effects

- **Cost Effect**: a higher \( d_t \) reflects a higher (expected) firing cost \( \Rightarrow \) reduces demand for labor
Demand for Labor

\[ n_t^y = (f')^{-1} \left( w_t^y + \beta \gamma d_t n_{t-1}^y \right) - (1 - d_t) e n_{t-1}^y \]

A rise in \( d_t \) has two opposing effects

- **Cost Effect:** a higher \( d_t \) reflects a higher (expected) firing cost \( \Rightarrow \) reduces demand for labor

- **Composition Effect:** a higher \( d_t \) increases \( n_t^y \) as more young are needed to replace old
Demand for Labor

\[
\frac{\partial n_y t}{\partial d t} = \left( \beta \gamma f'' + e \right) n_y t - 1 < 0 \iff \gamma > e \left( -f'' \right) / \beta
\]

Since \( d t \) is increasing in \( T_t \) if \( \sigma_t = 0 \):

Proposition \( n_y t \) is non-increasing in \( T_t \) when individuals are risk neutral and \( \gamma > e \left( -f'' \right) / \beta \).
Demand for Labor

\[
\frac{\partial n_t^y}{\partial d_t} = \left( \frac{\beta \gamma}{f''} + e \right) n_{t-1}^y
\]
Demand for Labor

\[
\frac{\partial n_t^y}{\partial d_t} = \left( \frac{\beta \gamma}{f''} + e \right) n_{t-1}^y
\]

\[
\frac{\partial n_t^y}{\partial d_t} < 0 \iff \gamma > e(-f'')/\beta
\]
Demand for Labor

\[
\frac{\partial n_t^\gamma}{\partial d_t} = \left( \frac{\beta \gamma}{f''} + e \right) n_{t-1}^\gamma
\]

\[
\frac{\partial n_t^\gamma}{\partial d_t} < 0 \iff \gamma > e(-f'')/\beta
\]

Since \(d_t\) is increasing in \(T_t\) if \(\sigma_t = 0\):
Demand for Labor

\[
\frac{\partial n_t^y}{\partial d_t} = \left( \frac{\beta \gamma}{f''} + e \right) n_{t-1}^y
\]

\[
\frac{\partial n_t^y}{\partial d_t} < 0 \iff \gamma > e(-f'')/\beta
\]

Since \( d_t \) is increasing in \( T_t \) if \( \sigma_t = 0 \):

**Proposition**

\( n_t^y \) is non increasing in \( T_t \) when individuals are risk neutral and \( \gamma > e(-f'')/\beta \).
Equilibrium

Labor Market Clearing:

\[ l(w, T) = n_y(w, T) + \text{budget balance restriction:} \]

\[ T_t = \tau(w_t l_t + \omega_t (1 - d_t) l_t - 1) \]
Equilibrium

Labor Market Clearing:

\[ l(y, T) = n^y(y, T) \]
Equilibrium

Labor Market Clearing:

\[ I(w^y, T) = n^y(w^y, T) \]

+ budget balance restriction:

\[ T_t d_t l_{t-1} = \tau \left( w_t^y l_t + w_t^o (1 - d_t) l_{t-1} \right) \]
Comparative Statics at Equilibrium

Let $(w(y), T(\gamma))$ be a stationary equilibrium with under-employment and assume that (a) individuals are risk neutral and (b) $\gamma > e^{-f''(l)} / \beta$. Then, $\partial w / \partial \gamma < 0$, $\partial w / \partial \gamma > 0$ and $\partial T / \partial \gamma \leq 0 \iff \tau e l (1 + \epsilon) + T_1 - \tau_1 \lambda f'' \geq 0$, where $\epsilon = V'(l) / l V''(l)$ is the elasticity of labor supply with respect to the wage rate.
Proposition

Let \( (w^y(\gamma), T(\gamma)) \) be a stationary equilibrium with under-employment and assume that (a) individuals are risk neutral and (b) \( \gamma > e(-f'')/\beta \). Then,
Proposition

Let \((w^y(\gamma), T(\gamma))\) be a stationary equilibrium with under-employment and assume that (a) individuals are risk neutral and (b) \(\gamma > e(-f'')/\beta\). Then,

- \(\partial w^y_t / \partial \gamma < 0\), \(\partial w^o_t / \partial \gamma > 0\) and
Proposition

Let \((w^y(\gamma), T(\gamma))\) be a stationary equilibrium with under-employment and assume that (a) individuals are risk neutral and (b) \(\gamma > e(-f'']/\beta\). Then,

\[ \frac{\partial w^y_t}{\partial \gamma} < 0, \quad \frac{\partial w^o_t}{\partial \gamma} > 0 \quad \text{and} \quad \frac{\partial T}{\partial \gamma} \leq 0 \iff \tau e l(1 + \epsilon) + \frac{T}{1 - \tau} \frac{1}{\lambda f''} \geq 0, \]

where \(\epsilon = V'(l)/IV''(l)\) is the elasticity of labor supply with respect to the wage rate.
**Motivation**

**The Model**

- **Optimal Contracts**
- **Comparative Statics**
- **Welfare**
- **Empirical Evidence**

---

**BBC:** Higher $w^y$, lower $d$ -> gov. surplus -> can afford higher $T$

**LME:** Higher $T$ -> higher $d$ (value of part. down) -> lower employment -> lower $w^y$

---

G. Ragusa and P. Reichlin

**The Social Cost of a Dual Labor Market**
**BBC:** Higher $\gamma$ implies higher $d$, gov. surplus -> can afford lower $w^y$

**LME:** Higher $\gamma$ implies less employment and lower $w^y$
Welfare effect of a change in \( \gamma \) at a stationary equilibrium, 
\[
(w_y(\gamma), T(\gamma))
\]

\[U_y t = (1 + \eta) u(R(1 - \tau) w_y t + T t + 1) - V(l_t),\]
\[U_{ot} = (1 + \eta) u(R(1 - \tau) w_y t - 1 l_t - 1 + T t + 1),\]
Welfare effect of a change in $\gamma$ at a stationary equilibrium, $(w^y(\gamma), T(\gamma))$
Welfare effect of a change in $\gamma$ at a stationary equilibrium, $(w^y(\gamma), T(\gamma))$

\[ U_t^y = (1 + \eta)u(R(1 - \tau)w_t^y l_t + T_{t+1}) - V(l_t), \]
Welfare

Welfare effect of a change in $\gamma$ at a stationary equilibrium, $(w^y(\gamma), T(\gamma))$

$$U^y_t = (1 + \eta) u(R(1 - \tau)w^y_t l_t + T_{t+1}) - V(l_t),$$

$$U^o_t = (1 + \eta) u(R(1 - \tau)w^y_{t-1} l_{t-1} + T_t)$$
Welfare

\[ \frac{\partial U}{\partial \gamma} = R(1 - \tau) \frac{\partial l}{\partial T} + B \frac{\partial T}{\partial \gamma} , \]

where

\[ A = (1 + \eta (1 + \epsilon)) u'(c) + \epsilon (1 - d) \left( u'(c) - u'(c + \epsilon) \right) > 0 \]

\[ B = R(1 - \tau) w \frac{\partial l}{\partial T} \left( \eta u' + (1 - d) \left( u' - u'(c + \epsilon) \right) \right) + (1 + \eta) u' \]
Welfare

\[
\frac{\partial U^y}{\partial \gamma} = R(1 - \tau) A \frac{\partial w^y}{\partial \gamma} + B \frac{\partial T}{\partial \gamma},
\]

where

\[
A = (1 + \eta(1 + \epsilon))u'(c^u) + \epsilon(1 - d) \left( u'(c^u) - u'(c^e) \right) > 0
\]

\[
B = R(1 - \tau) w^y \frac{\partial l}{\partial T} (\eta u'(c^u) + \eta u'(c^e)) + (1 - d) \left( u'(c^u) - u'(c^e) \right) + (1 + \eta)u'(c^u)
\]
Proposition

Let \( (w_y(\gamma), T(\gamma)) \) be stationary equilibrium values at which the optimal stationary contract implies under-employment and assume (a) individuals are risk neutral and (b) 

\[-f''(h) \leq \frac{\gamma \beta}{e}.\]

Then, a fall in \( \gamma \) is Pareto improving if and only if 

\[\frac{\partial T}{\partial \gamma} \leq 0,\]

i.e.,

\[\tau_1 e (1 + \epsilon) + T_2 - \tau_1 \lambda f'' \geq 0.\]
Proposition

Let \((w^y(\gamma), T(\gamma))\) be stationary equilibrium values at which the optimal stationary contract implies under-employment and assume that (a) individuals are risk neutral and (b) \(-f''(h) \leq \gamma \beta / e\). Then, a fall in \(\gamma\) is Pareto improving if and only if \(\partial T / \partial \gamma \leq 0\), i.e.,

\[
\tau el(1 + \epsilon) + \frac{T}{1 - \tau} \frac{1}{\lambda f''} \geq 0.
\]
Some Empirical Evidence

Are the prediction of the model supported by the empirical evidence?
Some Empirical Evidence

- Are the prediction of the model supported by the empirical evidence?

- We focus here on the prediction on the salary of the young in response to a change in the “firing cost”
Are the prediction of the model supported by the empirical evidence?

We focus here on the prediction on the salary of the young in response to a change in the “firing cost”

The model predict the salary of young is decreasing $\gamma$ and in $w^o$. 
Objective

- Identifying the effect of EPL on wages is very difficult
Objective

- Identifying the effect of EPL on wages is very difficult
- Test the implications on the insider-outsider of the theoretical model
Data

- European Union Statistics on Income and Living Conditions (EU-SILC) Microdata
Data

- European Union Statistics on Income and Living Conditions (EU-SILC) Microdata
  - hourly wage, education, etc.
Data

- European Union Statistics on Income and Living Conditions (EU-SILC) Microdata
  - hourly wage, education, etc.
- Employment protection from OECD
ELP Measure

Three possible EPL measures

1. Indicator for dismissal of employees on regular contracts
ELP Measure

Three possible EPL measures

1. Indicator for dismissal of employees on regular contracts

2. Indicator for strictness of regulation on temporary contracts
ELP Measure

Three possible EPL measures

1. Indicator for dismissal of employees on regular contracts
2. Indicator for strictness of regulation on temporary contracts
3. Indicator for additional regulation of collective dismissal
Indicator for dismissal of employees on regular contracts

Dismissal of employees on regular contracts, 2006

Countries
- United States
- United Kingdom
- Switzerland
- Canada
- Australia
- Ireland
- Denmark
- New Zealand
- Belgium
- Italy
- Japan
- Hungary
- Poland
- Finland
- Norway
- Mexico
- Slovak Republic
- Greece
- Korea
- Austria
- Spain
- France
- Turkey
- Sweden
- Germany
- Netherlands
- Czech Republic
- Portugal

G. Ragusa and P. Reichlin  The Social Cost of a Dual Labor Market
Motivation

The Model

Optimal Contracts

Comparative Statics

Welfare

Empirical Evidence

Indicator for strictness of regulation on temporary contracts

Strictness of regulation on temporary contracts, 2006

Countries

Strictness of regulation on temporary contracts, 2006

United States
Canada
United Kingdom
Slovak Republic
Ireland
Czech Republic
Australia
Japan
Switzerland
Hungary
Netherlands
New Zealand
Germany
Denmark
Austria
Sweden
Korea
Poland
Italy
Finland
Belgium
Portugal
Norway
Greece
Spain
France
Mexico
Turkey

G. Ragusa and P. Reichlin

The Social Cost of a Dual Labor Market
Indicator for additional regulation of collective dismissal

Additional regulation of collective dismissal, 2006

Countries:
- New Zealand
- Japan
- Korea
- France
- Czech Republic
- Turkey
- Ireland
- Finland
- Canada
- United States
- United Kingdom
- Portugal
- Norway
- Hungary
- Australia
- Netherlands
- Spain
- Denmark
- Greece
- Austria
- Poland
- Sweden
- Slovak Republic
- Mexico
- Germany
- Switzerland
- Belgium
- Italy

G. Ragusa and P. Reichlin
The Social Cost of a Dual Labor Market
Our choice

- Our choice is the average of the indicator for dismissal of employees on regular contracts and -indicator for additional regulation of collective dismissal.
We consider three specifications:

1. \[ \log \text{wage}_{ic} = \beta_0 + \beta_1 EPL_c + \beta_2 EPL_c \times \text{age}_{ic} + \ldots \]
We consider three specifications:

1. \[ \log \text{wage}_{ic} = \beta_0 + \beta_1 EPL_c + \beta_2 EPL_c \times \text{age}_{ic} + \ldots \]

2. \[ \log \text{wage}_{ic} = \gamma_0 + \gamma_1 EPL_c + \gamma_2 EPL_c \times \text{Temp}_c + \ldots \]
We consider three specifications:

1. \[ \log \text{wage}_{ic} = \beta_0 + \beta_1 EPL_c + \beta_2 EPL_c \times \text{age}_{ic} + \ldots \]

2. \[ \log \text{wage}_{ic} = \gamma_0 + \gamma_1 EPL_c + \gamma_2 EPL_c \times \text{Temp}_{c} + \ldots \]

3. \[ \log \text{wage}_{ic} = \delta_0 + \delta_1 EPL_c + \delta_2 EPL_c \times \text{Temp}_{ic} + \delta_3 EPL_c \times \text{age}_{ic} + \ldots \]
<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) log(w)</th>
<th>(2) log(w)</th>
<th>(3) log(w)</th>
<th>(4) log(w)</th>
<th>(5) log(w)</th>
<th>(6) log(w)</th>
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</thead>
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<tr>
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<td>-0.0130</td>
<td>0.0348</td>
<td>0.0357</td>
<td>-0.00848</td>
<td>0.0467</td>
<td>0.000266</td>
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<tr>
<td></td>
<td>(0.0820)</td>
<td>(0.0498)</td>
<td>(0.0504)</td>
<td>(0.0453)</td>
<td>(0.0472)</td>
<td>(0.0416)</td>
</tr>
<tr>
<td>( EPL \times age )</td>
<td>0.00827***</td>
<td>(0.00118)</td>
<td>0.00790***</td>
<td>(0.00135)</td>
<td></td>
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<tr>
<td>( Temp )</td>
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<td>-0.221***</td>
<td>0.223</td>
<td>-0.154**</td>
<td>-0.0948</td>
<td></td>
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<tr>
<td></td>
<td>(0.0299)</td>
<td>(0.0297)</td>
<td>(0.152)</td>
<td>(0.0551)</td>
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<tr>
<td>( Temp \times EPL )</td>
<td></td>
<td></td>
<td></td>
<td>-0.154**</td>
<td>-0.0948</td>
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<tr>
<td>age</td>
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<td>0.0167***</td>
<td>-0.00654*</td>
<td>0.0167***</td>
<td>-0.00547</td>
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<td>(0.00309)</td>
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<tr>
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<td>-0.375***</td>
<td>-0.361***</td>
<td>-0.374***</td>
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<tr>
<td></td>
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<td>0.284***</td>
<td>0.282***</td>
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<td>0.282***</td>
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<tr>
<td></td>
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<tr>
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<td>-0.152**</td>
<td>-0.151**</td>
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<tr>
<td></td>
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<td>(0.0648)</td>
<td>(0.0657)</td>
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<td>Observations</td>
<td>34,711</td>
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<td>R-squared</td>
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<td>0.267</td>
<td>0.274</td>
<td>0.268</td>
<td>0.274</td>
</tr>
</tbody>
</table>

Clustered Robust standard errors in parentheses
Specification 1: $\Delta EPL = 1 \Rightarrow \Delta \text{wage} = -1.3\%$
Interpretation

- Specification 1: $\Delta EPL = 1 \Rightarrow \Delta wage = -1.3\%$

- Specification 2: $\Delta EPL = 1 \Rightarrow \Delta wage = -3.4\%$ (not statistically sign.)
Interpretation

- Specification 1: $\Delta EPL = 1 \Rightarrow \Delta \text{wage} = -1.3\%$

- Specification 2: $\Delta EPL = 1 \Rightarrow \Delta \text{wage} = -3.4\%$ (not statistically sign.)

- Specification 3: Same even controlling for temporary jobs
Specification 4: $\Delta EPL = 1 \Rightarrow \Delta \text{wage} = -0.08\%$ for age 35 and $\Delta EPL = 1 \Rightarrow \Delta \text{wage} = 8\%$ every 10 years above 35
• Specification 4: \( \Delta EPL = 1 \Rightarrow \Delta \text{wage} = -0.08\% \) for age 35
  and \( \Delta EPL = 1 \Rightarrow \Delta \text{wage} = 8\% \) every 10 years above 35

• Specification 5: \( \Delta EPL = 1 \Rightarrow \Delta \text{wage} = -15\% \) for temporary
Specification 4: $\Delta EPL = 1 \Rightarrow \Delta wage = -0.08\%$ for age 35 and $\Delta EPL = 1 \Rightarrow \Delta wage = 8\%$ every 10 years above 35.

Specification 5: $\Delta EPL = 1 \Rightarrow \Delta wage = -15\%$ for temporary.

Specification 6: $\Delta EPL = 1 \Rightarrow \Delta wage = -0.08\%$ for age 35 and $\Delta EPL = 1 \Rightarrow \Delta wage = 8\%$ every 10 years above 35.

As a result of $\Delta EPL$, Young regular don’t do much better than temporary.
Conclusion

- OLG model where the labor market is segmented across generations
Conclusion

- OLG model where the labor market is segmented across generations

- Older workers are able to (efficiently) bargain with firms over wages and employment and firms face firing costs
Conclusion

- OLG model where the labor market is segmented across generations

- Older workers are able to (efficiently) bargain with firms over wages and employment and firms face firing costs

- Younger workers offer their labor services in a competitive labor market
Assuming that individual labor productivity is unobservable and declining with age, and that firing costs are sufficiently high, we reproduce some stylized facts:
Conclusion

Assuming that individual labor productivity is unobservable and declining with age, and that firing costs are sufficiently high, we reproduce some stylized facts:

1. old and young workers’ wages are inversely related
Conclusion

- Assuming that individual labor productivity is unobservable and declining with age, and that firing costs are sufficiently high, we reproduce some stylized facts:

  1. old and young workers’ wages are inversely related

  2. with the former being higher and the latter being lower than individuals’ marginal productivity
Conclusion

- Assuming that individual labor productivity is unobservable and declining with age, and that firing costs are sufficiently high, we reproduce some stylized facts:

  1. old and young workers’ wages are inversely related
  2. with the former being higher and the latter being lower than individuals’ marginal productivity
  3. young workers’ wage and employment are declining with firing costs (under some cond.).
Assuming that individual labor productivity is unobservable and declining with age, and that firing costs are sufficiently high, we reproduce some stylized facts:

1. Old and young workers’ wages are inversely related

2. With the former being higher and the latter being lower than individuals’ marginal productivity

3. Young workers’ wage and employment are declining with firing costs (under some cond.).

A fall in firing costs is Pareto improving for given tax rates.