Labour Market Policies and Unemployment Dynamics
A Cross-Country Comparison

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Introduction
How much of unemployment dynamics can be accounted for by Labour Market Policies?

We shall answer this classic question by constructing a small model of the labour market model such that

- Aggregate shocks to GDP fuel the cycle
- LMPs induce structural change.

The model will be separately estimated on 9 different countries: Australia, Germany, Spain, France, UK, Japan, Portugal, Sweden and USA.
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The literature: reduced form studies


<table>
<thead>
<tr>
<th></th>
<th>Log UNR</th>
<th>Log LDR</th>
<th>Log JFR</th>
<th>Log V</th>
<th>Log Tightness</th>
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<tbody>
<tr>
<td>Initial Replacement Rate</td>
<td>0.130</td>
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<td>ALMP: Placement</td>
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<td>-0.041</td>
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<td>-0.324</td>
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<td>-0.070</td>
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<td>-0.003</td>
<td>-0.047</td>
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</tr>
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</table>

Notes: 1) All regressions contain country fixed effects and country-specific controls for business cycle (ie the HP-filtered log GDP). 2) Italicized estimates are not significant at the 5% level. 3) UNR: Unemployment Rate; LDR: Layoff rate; JFR: Job Finding Rate; V: Vacancies; Tightness = vacancies/unemployment.
The literature: small structural models

- Small structural model focusing on one policy
  - Ljungqvist and Sargent (1998) study welfare policies;
Our approach

- We develop a hybrid approach that aims at bridging the gap between the two approaches:
  - Structural shocks to production
    - Search-matching framework à la Mortensen-Pissarides (RES, 1990)
    - Rent sharing à la Postel-Vinay-Robin (Ecta, 2002)
    - Worker heterogeneity as in Robin (Ecta, 2011)
  - Lots of LMPs
    - Non anticipated policy interventions
    - Myopic expectations on LMPs
Theory
Aggregate shocks

- Time is discrete and indexed by \( t \in \mathbb{N} \).
- The global state of the economy is described by a Markov chain \( y_t \in \{y_1 < \ldots < y_N\} \) with transition probability matrix \( \Pi = (\pi_{ij}) \).
- Aggregate shocks accrue at the beginning of each period.
Heterogeneity

- There are $M$ types of workers and $\ell_m$ workers of each type (with $\sum_{m=1}^{M} \ell_m = 1$).
- Each type is characterized by a time-invariant ability $x_m$, $m = 1, ..., M$, with $x_m < x_{m+1}$.
- Firms are identical.
Matches

- Workers are paired with firms to form productive units.
- The per-period output of a job, if the worker is of ability $x_m$ and aggregate productivity is $y_i$, is $y_i(m) = x_m y_i$.
- Matches form and break at the beginning of each period, after realisation of the aggregate shock.
Unemployment and job destruction

- Let $u_t(m)$ denote the proportion of unemployed workers of ability $x_m$ at the end of period $t - 1$.
- Let $u_t = \sum_{m=1}^{M} u_t(m)\ell_m$ denote the aggregate unemployment rate.

I denote as $S_i(m)$ the surplus of a match $(x_m, y_i)$.

- Only matches with $S_i(m) > 0$ are viable.

At the beginning of period $t$,

- A fraction $1\{S_i(m) \leq 0\}[1 - u_t(m)]\ell_m$ of employees is endogenously laid off.
- Another fraction $\delta 1\{S_i(m) > 0\}[1 - u_t(m)]\ell_m$ is exogenously destroyed.
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Meetings

- Matching is random and firms with a vacancy can either meet an unemployed worker or an employed worker.
- Let $\lambda_t$ denote the meeting rate. The relative search intensity of employees is set as $k = 0.12$.
- At the beginning of period $t$,
  - A fraction $\lambda_t 1\{S_t(m) > 0\} u_t(m) \ell_m$ of unemployed workers meet an employer.
  - A fraction $k \lambda_t$ of employed workers meet an alternative employer.
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Rent sharing

- We assume that employers have full monopsony power with respect to unemployed workers. So they keep all the surplus in this case.
- However, employed workers search on the job, and Bertrand competition transfers all the surplus to the poached employees.
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Vacancy creation

- Firms posts vacancies $\nu_t$ until ex ante profits are exhausted (free entry). The total vacancy cost is $c\nu_t$.
- For $y_t = y_i$, free entry ensures that
  
  $$c\nu_t = \lambda_t \sum_{m=1}^{M} u_t(m)\ell_m S_i(m)^+$$

  where we denote $x^+ = \max(x, 0)$.
- A matching function relates the job finding rate $\lambda_t$ to tightness $\theta_t$:
  
  $$\lambda_t = f(\theta_t) \quad \text{with} \quad \theta_t = \frac{\nu_t}{u_t + k(1-\delta)(1-u_t)}$$
Vacancy creation

- Firms posts vacancies $v_t$ until ex ante profits are exhausted (free entry). The total vacancy cost is $cv_t$.
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Turnover rates

The following turnover rates can then be computed:

- Exit rate from unemployment:
  \[ f_t = \lambda_t \sum_m 1\{S_t(m) > 0\} u_t(m) \ell_m \]

- Job destruction rate:
  \[ s_t = \delta + (1 - \delta) \sum_m 1\{S_t(m) \leq 0\} \frac{(1 - u_t(m)) \ell_m}{1 - u_t} \]
Unemployment dynamics

- The law of motion of individual-specific unemployment rates is such that, at the end of period $t$,

$$u_{t+1}(m) = 1 - [(1 - \delta)(1 - u_t(m)) + \lambda_t u_t(m)]\mathbf{1}\{S_t(m) > 0\}$$

$$= \begin{cases} 
1 & \text{if } S_t(m) \leq 0, \\
 u_t(m) + \delta(1 - u_t(m)) - \lambda_t u_t(m) & \text{if } S_t(m) > 0.
\end{cases}$$

- Note that $u_{t+1} - u_t = s_t(1 - u_t) - f_t u_t$. 
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The match surplus

- The surplus of a match \((x_m, y_i)\) solves the following (nearly linear) Bellman equation:

\[
S_i(m) = y_i(m) - z + \frac{1 - \delta}{1 + r} \sum_j \pi_{ij} S_j(m)^+,
\]

where we denote \(x^+ = \max(x, 0)\) and \(z\) is the flow utility of unemployment.

- After a productivity shock from \(i\) to \(j\) the continuation surplus is zero if the match is destroyed.
- If the worker is poached, Bertrand competition transfers the whole surplus to the worker whether s/he moves or not.

- This nearly-linear system of equations can be numerically solved by value function iteration.
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Empirical analysis
Data construction


- Although unemployment data allow for monthly frequency in some countries, the time unit is uniformly chosen equal to one quarter because productivity series are (at most) quarterly.

- Need data on
  - unemployment stock at the end of period \( t - 1 \): \( u_t \)
  - job destruction rate in period \( t \): \( s_t \)
  - job finding rate in period \( t \): \( f_t = \frac{s_t(1-u_t)-u_{t+1}+u_t}{u_t} \)
  - vacancies: \( v_t \)

- We calculate \( f_t \) and \( s_t \) from flows and impose \( u_{t+1} = u_t + s_t(1-u_t) - f_t u_t \).

- For time aggregation, we iterate:

\[
\begin{align*}
u_{t+2} &= s_{t+1} + [1 - s_{t+1} - f_{t+1}] u_{t+1} \\
&= \underbrace{s_{t+1} + [1 - s_{t+1} - f_{t+1}] s_t}_{s_t/t+2} + \underbrace{[1 - s_{t+1} - f_{t+1}] [1 - s_t - f_t]}_{1-s_t/t+2-f_t/t+2} u_t
\end{align*}
\]
10 structural parameters

Markov chain for \( y_t = y_i \) for \( i = 1, \ldots, N = 100 \). Discretization of an AR(1) process for log-wages with autocorrelation \( \rho \) and variance \( \sigma^2 \).

2. Exogenous job destruction rate \( \delta \)

3. Matching function: \( f(\theta) = \phi \theta^n \)

4. Ability:
   - 500 equidistant nodes in \([C, C+1]\).
   - The distribution of individual ability is beta-distributed: \( \ell_m = \text{betapdf}(x_m, \nu, \mu) \)

5. Vacancy cost: \( c \)

6. Opportunity cost of employment: \( z \)
Labour Market Policies (LMPs)

1. UI benefit
2. Initial replacement rate (RR)
3. ALMP expenditure (ALMP expenditure per unemployed wkr/GDP per employee):
   1. Employment & Placement Services
   2. Training
   3. Incentives (e.g. payroll tax reduction for low wage workers)
4. Product market regulation OECD index (PMR)
5. OECD Employment Protection index for regular contracts (EPLR)
6. Tax wedge

- We center LMPs country by country and standardise them by mean std.
How LMP enters the model

- We assume that LMP changes are not anticipated: Individuals observe the change when it occurs and incorporate it in the surplus calculations with myopic expectations on future changes.

- Crude intervention mechanisms: Each government intervention shifts structural parameters $\phi, \delta$ and $c$, as in

$$
\log \phi_t = \phi + LMP_t \tilde{\phi} \\
\log \delta_t = \delta + LMP_t \tilde{\delta} \\
\log c_t = c + LMP_t \tilde{c}
$$

- All parameters are country-specific except for LMP effects $\tilde{\phi}, \tilde{\delta}, \tilde{c}$. 
Estimation

1. Estimate parameters by matching moments of detrended series of GDP, unemployment rates, job finding rates, job destruction rates and ‘tightness’ \( V/U \).

2. Filter productivity shocks by minimising the SSR of GDP.

3. Estimate LMP effects by fitting GDP cycle and actual series (trend and cycle) of unemployment, JFR, JDR and tightness.
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Remarks on estimation

- We use GDP instead of GDP per worker because of negative correlation between productivity and employment in AUS and SWE!
- We arbitrarily set the matching elasticity $\eta$ in $[0, 1]$. Surprisingly, for any choice of $\eta$ there seems to be a choice of the other parameters that fits as well.
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Results
The Business Cycle model
Estimated parameters

- $C < z \Rightarrow$ endogenous job destruction

<table>
<thead>
<tr>
<th></th>
<th>AUS</th>
<th>FRA</th>
<th>DEU</th>
<th>JAP</th>
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<th>ESP</th>
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<td>$\rho$</td>
<td>0.970</td>
<td>0.938</td>
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<td>0.942</td>
<td>0.842</td>
<td>0.972</td>
<td>0.961</td>
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<tr>
<td>$\sigma$</td>
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<td>0.025</td>
<td>0.026</td>
<td>0.026</td>
<td>0.029</td>
<td>0.023</td>
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<tr>
<td>$C$</td>
<td>0.701</td>
<td>0.679</td>
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<td>0.514</td>
<td>0.826</td>
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<td>0.700</td>
<td>0.695</td>
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<td>$\mathbb{E}(\alpha)$</td>
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<td>0.990</td>
<td>0.980</td>
<td>0.982</td>
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<tr>
<td>$\text{sd}(\alpha)$</td>
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<td>0.716</td>
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<td>$c$</td>
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<td>0.500</td>
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Moments fit

<table>
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<tr>
<th></th>
<th>AUS true</th>
<th>AUS sim.</th>
<th>DEU true</th>
<th>DEU sim.</th>
<th>ESP true</th>
<th>ESP sim.</th>
<th>FRA true</th>
<th>FRA sim.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean GDP</td>
<td>1.002</td>
<td>1.000</td>
<td>1.001</td>
<td>1.000</td>
<td>1.001</td>
<td>0.993</td>
<td>1.000</td>
<td>0.997</td>
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<tr>
<td>Std log GDP</td>
<td>0.017</td>
<td>0.018</td>
<td>0.021</td>
<td>0.024</td>
<td>0.028</td>
<td>0.029</td>
<td>0.019</td>
<td>0.022</td>
</tr>
<tr>
<td>Autocorr. log GDP</td>
<td>0.927</td>
<td>0.980</td>
<td>0.925</td>
<td>0.942</td>
<td>0.963</td>
<td>0.982</td>
<td>0.972</td>
<td>0.954</td>
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<tr>
<td>Mean unemployment</td>
<td>0.074</td>
<td>0.075</td>
<td>0.091</td>
<td>0.092</td>
<td>0.159</td>
<td>0.156</td>
<td>0.098</td>
<td>0.095</td>
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<tr>
<td>Std log unempl.</td>
<td>0.125</td>
<td>0.124</td>
<td>0.118</td>
<td>0.117</td>
<td>0.191</td>
<td>0.190</td>
<td>0.087</td>
<td>0.085</td>
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<tr>
<td>Kurtosis log unempl.</td>
<td>2.624</td>
<td>2.546</td>
<td>3.277</td>
<td>3.177</td>
<td>1.663</td>
<td>2.103</td>
<td>1.559</td>
<td>2.250</td>
</tr>
<tr>
<td>Mean JFR</td>
<td>0.477</td>
<td>0.480</td>
<td>0.184</td>
<td>0.182</td>
<td>0.207</td>
<td>0.207</td>
<td>0.223</td>
<td>0.227</td>
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<tr>
<td>Std log JFR</td>
<td>0.122</td>
<td>0.128</td>
<td>0.138</td>
<td>0.140</td>
<td>0.190</td>
<td>0.219</td>
<td>0.134</td>
<td>0.094</td>
</tr>
<tr>
<td>Mean LDR</td>
<td>0.038</td>
<td>0.038</td>
<td>0.018</td>
<td>0.018</td>
<td>0.037</td>
<td>0.037</td>
<td>0.024</td>
<td>0.024</td>
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<tr>
<td>Std log LDR</td>
<td>0.066</td>
<td>0.027</td>
<td>0.078</td>
<td>0.075</td>
<td>0.110</td>
<td>0.054</td>
<td>0.085</td>
<td>0.035</td>
</tr>
<tr>
<td>Mean tightness</td>
<td>0.136</td>
<td>0.135</td>
<td>0.152</td>
<td>0.154</td>
<td>0.029</td>
<td>0.029</td>
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### Moments fit

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Unemployment Cycle

1985 1995 2005

Cyclical unemployment

AUS  B

DEU  C

ESP  D

FRA  E

GBR  F

JPN  G

PRT  H

SWE  I

USA  J

Murtin, Robin (OECD, ScPo & UCL)  Labour Market Policies  10th May 2013  29 / 40
## Correlation Between Actual and Simulated Unfiltered Series

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<thead>
<tr>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<td>0.87</td>
<td>0.73</td>
<td>0.92</td>
<td>0.77</td>
<td>0.87</td>
<td>0.75</td>
<td>0.81</td>
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<td>0.64</td>
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<td>0.74</td>
<td>0.77</td>
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<td>Job Destruction Rate</td>
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Conclusions on BC model

- Right amplification of productivity shocks
- In many countries the fit is good beyond unemployment fluctuations.
- However, some (relative) failure regarding tightness and employment/unemployment flows.
- This may be an artifact of the HP-filtering procedure as the following analysis tends to show.
Results
Trends
LMP effects

- Effect of a one-std increase in policy.
- We a priori shunt certain channels for identification.

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<tr>
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<td>ALMP Incentives</td>
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<td>Product Market Regulation</td>
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<td>Employment Protection (regular contracts)</td>
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<td>Tax wedge</td>
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<td>Mean Years of Higher Education</td>
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<tr>
<td>Share 15-24 population</td>
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<td>Share 55-64 population</td>
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## LMP effects on unemployment

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<td>-0.22</td>
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<td>Placement (+1 sd)</td>
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<td>Tax wedge (+1 sd)</td>
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<td>-0.17</td>
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Unemployment trends

AUS

DEU

ESP

FRA

GBR

JPN

PRT

SWE

USA
JFR trends

Murtin, Robin (OECD, ScPo & UCL)
### LDR trends

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Murtin, Robin (OECD, ScPo & UCL)
Market tightness trends
## Correlation Between Actual and Simulated Unfiltered Series

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Conclusion

- One (simple) model of LMP intervention fits them all.
- Main lessons:
  - ALMP - Placement and Employment Services: most important (+1sd = -1% UNR).
  - Other LMPs are less effective (+1 sd = between .2 and .33 pct points).
- More accurate mechanisms of policy interventions.