The Ins and Outs of Unemployment in a Dual Labor Market

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Motivation

• What explains fluctuations in the unemployment rate?
  o Ins into and out of unemployment: which wins?

• Reach literature (Shimer, 2007/2012 and Petrongolo and Pissarides, 2008)

• Little evidence in developing countries

• How to use this framework in dual labor markets
Note: Unemployment rate is calculated based on PME (IBGE) data for individuals aged 15 years of age or more.
Figure 1b – Formal Employment in Brazil
Traditional approach

• Shimer (2012) and Petrongolo e Pissarides (2008)
• Express the unemployment rate as a ratio of transition probabilities between Employment (E) and Unemployment (U)...

\[ u_t = s_t e_t - f_t u_t = s_t (1 - u_t) - f_t u_t \]

\[ u_t = \frac{s_t}{s_t + f_t} \]

• ... and Inactivity (I):

\[ u_t = \frac{\lambda_{EU}^t + \lambda_{IU}^t \lambda_{EI}^t}{\lambda_{EU}^t + \lambda_{IU}^t + \lambda_{IE}^t \lambda_{EI}^t + \lambda_{UE}^t + \lambda_{IE}^t \lambda_{UI}^t} \]
Labor Market transitions in Brazil

- Data: PME (2003-2015); all series are hp-filtered
Evolution of the Unemployment rate

\[ u_t = \frac{\lambda_t^{EU} + \frac{\lambda_t^{IU}}{\lambda_t^{IU} + \lambda_t^{IE}} \lambda_t^{EI}}{\lambda_t^{EU} + \frac{\lambda_t^{IU}}{\lambda_t^{IU} + \lambda_t^{IE}} \lambda_t^{EI} + \lambda_t^{UE} + \frac{\lambda_t^{IE}}{\lambda_t^{IU} + \lambda_t^{IE}} \lambda_t^{UE}} \]

\[ \rho = 0.96 \]
Results: 3 states model

- Contributions from each transition:

\[ \beta_{AB} = \frac{\text{cov}(u_{t}^{AB}, u_{t})}{\text{var}(u_{t})} \]

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>E → U</td>
<td>0.472</td>
<td>-0.057</td>
</tr>
<tr>
<td>E → I</td>
<td>0.057</td>
<td>0.008</td>
</tr>
<tr>
<td>U → I</td>
<td>0.071</td>
<td>0.120</td>
</tr>
<tr>
<td>U → E</td>
<td>0.147</td>
<td>0.815</td>
</tr>
<tr>
<td>I → U</td>
<td>0.269</td>
<td>0.208</td>
</tr>
<tr>
<td>I → E</td>
<td>-0.041</td>
<td>0.164</td>
</tr>
</tbody>
</table>

Graphs showing hypothetical and steady state trends for Employment-Unemployment, Inactivity-Unemployment, and Unemployment-Employment transitions from 2003 to 2014.
Brazil: dual labor market

• Brazilian labor market has a large informal sector

<table>
<thead>
<tr>
<th></th>
<th>Original Obs.</th>
<th>Original %</th>
<th>Corrected Obs.</th>
<th>Corrected %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Out of labor force</td>
<td>1,915,093</td>
<td>34.8%</td>
<td>1,946,637</td>
<td>35.4%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>318,034</td>
<td>5.8%</td>
<td>268,896</td>
<td>4.9%</td>
</tr>
<tr>
<td>Self employed</td>
<td>620,677</td>
<td>11.3%</td>
<td>624,815</td>
<td>11.4%</td>
</tr>
<tr>
<td>Employer</td>
<td>146,252</td>
<td>2.7%</td>
<td>139,505</td>
<td>2.5%</td>
</tr>
<tr>
<td>Informal employment</td>
<td>624,317</td>
<td>11.3%</td>
<td>594,005</td>
<td>10.8%</td>
</tr>
<tr>
<td>Formal employment</td>
<td>1,880,985</td>
<td>34.2%</td>
<td>1,931,500</td>
<td>35.1%</td>
</tr>
<tr>
<td>Total</td>
<td>5,505,985</td>
<td>100.0%</td>
<td>5,505,985</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

• However, informality fell sharply in the past decade whereas total employment experienced significant growth
  • i.e. formal and informal employment must have had different dynamics

• How has these different trends impacted unemployment?

• Does accounting for these differences change the results?
Brazil: dual labor market

• We extend Shimer’s model by adding one extra state:
  \[ E = E_0 + E_1 \]

• The dynamics of each state can be described by:

\[
\begin{align*}
\dot{U}_t &= \lambda_t^{0U} E_t^0 + \lambda_t^{1U} E_t^1 + \lambda_t^{IU} I_t - (\lambda_t^{0U} + \lambda_t^{1U} + \lambda_t^{IU}) U_t \\
E_t^0 &= \lambda_t^{0U} U_t + \lambda_t^{0I} I_t + \lambda_t^{10} E_t^1 - (\lambda_t^{0U} + \lambda_t^{0I} + \lambda_t^{10}) E_t^0 \\
E_t^1 &= \lambda_t^{1U} U_t + \lambda_t^{1I} I_t + \lambda_t^{01} E_t^0 - (\lambda_t^{1U} + \lambda_t^{1I} + \lambda_t^{01}) E_t^1 \\
i_t &= \lambda_t^{UI} U + \lambda_t^{0I} E_t^0 + \lambda_t^{1I} E_t^1 - (\lambda_t^{UI} + \lambda_t^{0I} + \lambda_t^{1I}) I_t
\end{align*}
\]

• In steady state, \( \dot{U}_t = E_t^0 = E_t^1 = 0 \).
Brazil: dual labor market

Manipulate these equations to get:

\[
(\lambda_t^{10}(\lambda_t^{U0} + \lambda_t^{U1} + \lambda_t^{UI}) + \lambda_t^{IU} \lambda_t^{U0})U_t = (\lambda_t^{IU}(\lambda_t^{01} + \lambda_t^{0U} + \lambda_t^{0I}))E_t^{0} + (\lambda_t^{10} \lambda_t^{1U} - \lambda_t^{IU} \lambda_t^{10})E_t^{1}
\]

\[
(\lambda_t^{11}(\lambda_t^{U0} + \lambda_t^{U1} + \lambda_t^{UI}) + \lambda_t^{IU} \lambda_t^{U1})U_t = (\lambda_t^{IU}(\lambda_t^{10} + \lambda_t^{1U} + \lambda_t^{1I}))E_t^{1} + (\lambda_t^{11} \lambda_t^{0U} - \lambda_t^{IU} \lambda_t^{01})E_t^{0}
\]

Or simply:

\[
\tilde{f}U = \tilde{s}_0 E^0 + \tilde{s}_1 E^1
\]

\[
\hat{f}U = \hat{s}_1 E^1 + \hat{s}_0 E^0
\]

Which yields the 4-state unemployment rate dynamics:

\[
u = \frac{\tilde{s}_0 \left( \frac{\tilde{f} \tilde{s}_1 - \tilde{f} \hat{s}_1}{\tilde{f} \hat{s}_0 - \tilde{f} \tilde{s}_0} \right) + \tilde{s}_1}{\tilde{s}_0 \left( \frac{\hat{f} \hat{s}_1 - \hat{f} \tilde{s}_1}{\hat{f} \tilde{s}_0 - \hat{f} \tilde{s}_0} \right) + \hat{s}_1 + \hat{f} \left( 1 + \left( \frac{\tilde{f} \tilde{s}_1 - \tilde{f} \hat{s}_1}{\tilde{f} \hat{s}_0 - \tilde{f} \tilde{s}_0} \right) \right)}
\]
Transitions in Brasil: accounting for informality
Evolution of the Unemployment rate (2)

3 states:

\[
u_t = \frac{\lambda_t^E + \frac{\lambda_t^I}{\lambda_t^I + \lambda_t^E} \lambda_t^E}{\lambda_t^E + \frac{\lambda_t^I}{\lambda_t^I + \lambda_t^E} \lambda_t^E + \frac{\lambda_t^I}{\lambda_t^I + \lambda_t^E} \lambda_t^I}\]

4 states:

\[
u = \frac{\tilde{s}_0 \left( \frac{\hat{f} \tilde{s}_1 - \hat{f} \tilde{s}_1}{\hat{f} \tilde{s}_0 - \hat{f} \tilde{s}_0} \right) + \tilde{s}_1}{\tilde{s}_0 \left( \frac{\hat{f} \tilde{s}_1 - \hat{f} \tilde{s}_1}{\hat{f} \tilde{s}_0 - \hat{f} \tilde{s}_0} \right) + \tilde{s}_1 + \hat{f} \left( 1 + \frac{\hat{f} \tilde{s}_1 - \hat{f} \tilde{s}_1}{\hat{f} \tilde{s}_0 - \hat{f} \tilde{s}_0} \right)}\]

Graph showing the evolution of the unemployment rate from 2003 to 2015 with steady state (3 and 4 states) and actual data.
## Results: 4-state model

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Informal → U</td>
<td>0.205</td>
<td>0.047</td>
</tr>
<tr>
<td>Informal → I</td>
<td>0.029</td>
<td>0.032</td>
</tr>
<tr>
<td>Informal → Formal</td>
<td>0.011</td>
<td>0.004</td>
</tr>
<tr>
<td>Formal → U</td>
<td>0.201</td>
<td>-0.103</td>
</tr>
<tr>
<td>Formal → I</td>
<td>-0.025</td>
<td>-0.031</td>
</tr>
<tr>
<td>Formal → Informal</td>
<td>0.154</td>
<td>-0.007</td>
</tr>
<tr>
<td>U → I</td>
<td>0.031</td>
<td>0.053</td>
</tr>
<tr>
<td>U → Formal</td>
<td>0.274</td>
<td>0.565</td>
</tr>
<tr>
<td>U → Informal</td>
<td>-0.197</td>
<td>0.164</td>
</tr>
<tr>
<td>I → U</td>
<td>0.299</td>
<td>0.265</td>
</tr>
<tr>
<td>I → Formal</td>
<td>0.066</td>
<td>0.125</td>
</tr>
<tr>
<td>I → Informal</td>
<td>-0.079</td>
<td>0.034</td>
</tr>
</tbody>
</table>

### Unemployment - Formal

![Graph Unemployment - Formal](image1)

### Formal – Unemployment

![Graph Formal – Unemployment](image2)

### Inactivity – Unemployment

![Graph Inactivity – Unemployment](image3)
Final remarks

• The decline in the unemployment rate in Brazil (2003-2015) is associated to:
  • Increase in formal finding rate
  • Decrease in the entry rate from inactivity
  • Increase in ‘employment hoarding’
    • Decrease in formal separation rates

• The increase in the unemployment rate in Brazil (2013-2015) is associated to:
  • Decrease in formal finding rate (both from U and I)
  • Increase in the entry rate from inactivity
  • No increase in separation rates yet

• Accounting for the duality of the LM is crucial for a complete understanding of different dynamics
Final remarks

• Conjectures
  • The movements of unemployment and formality are observed across all worker’s types, firms, sectors, regions, etc. Macroeconomic policies are potential candidates to explain these overall changes.
    • Interest rates, credit expansion, regulation costs of formal firms, etc.
  • Decrease in the transition from inactivity to labor market is partly due to young individuals postponing entry in the labor market and staying longer in school. Potential roles of the educational policies.