The Effects of Permanent and Temporary Shocks to Permanent and Temporary Employment: Time Series Evidence from the Korean Economy

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1. Introduction

■ Motivation:

- In the past two decades, temporary employment (TE) has grown rapidly in a number of developed countries such as Spain, France, and Korea.

- For example, TE/total employees ratio increased from 28.3% to 47.3% between 1983 and 2007 in Korea.

■ Our Question:

What is the dominant source of the long- and short-run movements in permanent employment (PE) and TE of Korea?
1. Introduction (cont)

This Paper

- answers to the question by comparing common and idiosyncratic movements of PE, TE, and output (Y).

- shows that

  (1) cyclical parts of TE and Y exhibit a strong comovement
  (2) while that of PE is insensitive to the short-run output fluctuations.
  (3) temporary shocks (T-shocks) explain much of the movement in TE in the short-run.
  (4) permanent shocks (P-shocks) account for almost all of the PE fluctuations even in the short-run.
2. Backgrounds

Q1: Why do firms use TE?
- Adjustment costs are low ⇒ (Numerical) Flexibility
  (i) Less firing costs and restrictions imposed by labor laws
  (ii) Firing does not affect remaining workers' effort

※ Goux et al., 2001; Abowd and Kramarz, 2003; Alonso-Borrego et al., 2005

Q2: Why do firms use PE?
- Productivity is high (Booth et al., 2002; Saint-Paul, 1996)
  (i) Firm-specific human capital
  (ii) Job satisfaction
- Separation rate is low (Wasmer, 1999)
2. Backgrounds (cont)

Q3: When do firms adjust PE/TE?
- Depends on the persistence of the shock that they face (Saint-Paul, 1996)
  (i) Given positive T-shock, firms will increase TE,
      since some workers should be fired as the effect of the shock vanishes
  (ii) Given positive P-shock, firms will increase PE to enhance productivity

■ Our Contribution
- Finding empirical evidence on
  whether PE reacts to the permanent component of the shock,
  and TE to its transitory component
  using time series technique
3. Econometric Methodology: Data Generating Process

- Basic Assumptions
  
  A.1) Random Causes (Impulse) and Propagation (Slutzky, 1927; Frisch, 1933)
  A.2) Stochastic trends (Beverage and Nelson, 1981)
  A.3) Common stochastic trends (Stock and Watson, 1988)

- By A.1. and A.2., we formalize the DGP as follows:
  \[
  \Delta X_t = C(L)\varepsilon_t
  \]
  where every component of \(X_t = \{PE_t, TE_t, Y_t\}'\) is I(1).

- (1) can be written in level form as follows:
  \[
  X_t = C(1)\sum_{s=1}^{t} \varepsilon_s + C^*(L)\varepsilon_t
  \]

- If A.3. holds, \(C(1)\) is not full rank (cointegration).
3. Econometric Methodology: Common factor representation

\[ X_t = A_1 f_t + \widetilde{X}_t \]
\[ = T_t + C_t \quad (3) \]

where \( f_t \): nonstationary common factors

\[ A_1 f_t = T_t : \text{trend (nonstationary)} \]
\[ \widetilde{X}_t = C_t : \text{cycle (stationary)} \]

- dimension of \( A_1 \) (# of common trend)

\[ = n - r \quad (n=# \text{ of variables}, \ r=# \text{ of cointegration}) \]

※ Examples of common stochastic trends

: productivity growth, labor force growth, institutional change etc.
3. Econometric Methodology: Trend-Cycle Decomposition
   (Gonzalo and Granger, 1995)

- Restrictions
  (i) $f_t$ is a linear combination of $X_t$
  (ii) $\bar{X}_t$ does not Granger-cause $X_t$ in the long run

- Procedure
  1. Estimating VECM
     \[
     \Delta X_t = \alpha \beta' X_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + e_t
     \]  
     (4)
     where $\alpha$: adjustment coefficient matrix, $\beta$: cointegration matrix.

  2. Calculating $f_t$
     \[f_t = \alpha'_{\perp} X_t, \quad A_1 = \beta_{\perp} (\alpha'_{\perp} \beta_{\perp})^{-1}\]
     where $\alpha_{\perp} (\beta_{\perp})$: the orthogonal complement of $\alpha (\beta)$
3. Econometric Methodology: Forecast Error Variance Decomposition

- Identifying P- and T-shocks (Issler and Vahid, 2001)

① One-step-ahead trend innovations $\leftarrow$ the first differences of the common trends.

② J-step-ahead trend innovations $\leftarrow$ cumulation of J consecutive one-step-aheads.

③ Cyclical innovations
   $\leftarrow$ residuals of the cyclical components regressed on the RHS variables of (4)

④ T-shocks $\leftarrow$ the residuals of the cyclical innovations regressed on the trend innovations
   P-shocks $\leftarrow$ the remainder of the total innovations
4. Empirical Results: Data

- Korean quarterly data on PE, TE, and real GDP for 1987:Q2~2007:Q4
- Employment: *Economically Active Population Survey* (National Statistical Office)
- GDP: *National Account*

Figure 1. Logarithms of Permanent Employment, Temporary Employment, and Output
4. Empirical Results: Integration properties

: All variables are I(1)
⇔ Stochastic trends (A.2)

Table 1. Unit root test results

<table>
<thead>
<tr>
<th></th>
<th>ERS</th>
<th>PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent Employment</td>
<td>-1.688(2)</td>
<td>-1.445(5)</td>
</tr>
<tr>
<td>Temporary Employment</td>
<td>-2.586(1)</td>
<td>-2.298(3)</td>
</tr>
<tr>
<td>Output</td>
<td>-1.389(1)</td>
<td>-2.278(2)</td>
</tr>
<tr>
<td>(ii) First Differences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent Employment</td>
<td>-3.377(1)***</td>
<td>-5.510(4)***</td>
</tr>
<tr>
<td>Temporary Employment</td>
<td>-3.530(1)***</td>
<td>-7.003(1)***</td>
</tr>
<tr>
<td>Output</td>
<td>-6.238(0)***</td>
<td>-6.814(2)***</td>
</tr>
</tbody>
</table>
4. Empirical Results: Cointegration properties

: 1 cointegration relationship

⇔ 2 common stochastic trends among 3 variables (A.3)

Table 2. Cointegration test results using Johansen's technique

<table>
<thead>
<tr>
<th></th>
<th>Trace test</th>
<th>Max test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$H_0$</td>
<td>$H_a$</td>
</tr>
<tr>
<td>$r = 0$</td>
<td>$r &gt; 0$</td>
<td></td>
</tr>
<tr>
<td>$r \leq 1$</td>
<td>$r &gt; 1$</td>
<td>19.998</td>
</tr>
<tr>
<td>$r \leq 2$</td>
<td>$r &gt; 2$</td>
<td>7.414</td>
</tr>
</tbody>
</table>

Estimated cointegration relationship: $TE_t = -0.537PE_t + 0.31Y_t + 0.004t$

Adjustment coefficients: $\alpha_{TE} = -0.443(-3.864)^*$, $\alpha_{PE} = -0.069(-0.636)$, $\alpha_Y = -0.401(-4.346)$
4. Empirical Results: Trend-Cycle Decomposition

- **Trends**
  - PE: move very closely to its trend ($\Rightarrow$ very small cycle)
  - TE & Y: show some gap ($\Rightarrow$ volatile cycle)
4. Empirical Results: Trend-Cycle Decomposition (cont)

- **Cycles**
  - TE is much more volatile than PE
  - TE and Y have similar cycles (amplitude, duration, highly correlated)
  - PE is insensitive to cyclical Y movements.

This shows
- TE is used as a "buffer" to absorb most cyclical output fluctuations, thus insulate PE from those movements.
4. Empirical Results: Variance Decomposition

- T-shocks are the main source of TE movements in the short run.
- P-shocks explain almost all the fluctuations in PE even in the short run.

<table>
<thead>
<tr>
<th>horizon (year)</th>
<th>Permanent Employment</th>
<th>Temporary Employment</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.7</td>
<td>75.7</td>
<td>55.4</td>
</tr>
<tr>
<td>2</td>
<td>0.3</td>
<td>43.7</td>
<td>39.8</td>
</tr>
<tr>
<td>3</td>
<td>0.2</td>
<td>28.3</td>
<td>28.9</td>
</tr>
<tr>
<td>4</td>
<td>0.1</td>
<td>14.8</td>
<td>11.9</td>
</tr>
<tr>
<td>5</td>
<td>0.1</td>
<td>12.8</td>
<td>11.9</td>
</tr>
<tr>
<td>10</td>
<td>0.4</td>
<td>20.6</td>
<td>6.0</td>
</tr>
</tbody>
</table>
4. Empirical Results: Variance Decomposition (cont)

This implies

- Firms' relative demand for PE vs. TE crucially depends on the persistence of the shock.

- As the persistence of demand shocks increases, firms may find the use of permanent workers more valuable, even though it may involve considerable adjustment costs

- supporting the theoretical speculation of Saint-Paul (1996)
5. Conclusions

① Cyclical components of TE and Y
    show a strong comovement and are much more volatile than that of PE

⇒ most cyclical fluctuations of Y are absorbed by TE
⇒ PE is insulated from those adjustments

② PE movements are affected only by P-shocks,
    whereas T-shocks explain a large proportion of cyclical movements of TE

⇒ Firms' relative demand for PE vs. TE crucially depend on
    the persistence of the shock
⇒ Firms may find the use of permanent workers more valuable as the persistence of
    demand shocks increases, even though it may involve considerable adjustment costs