Wage and price dynamics in Portugal

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Aim of the paper and methodology

- Investigate the persistence of aggregate wages and prices in Portugal.
- Given that the wages of a large majority of the Portuguese employees (90% in 2005) are set through collective wage agreements, we model wages and prices by assuming a unionized economy with imperfect competition, in line with the approach in Layard, Nickell and Jackman, 1991.
Aim of the paper and methodology

- The analysis is conducted within a structural vector error-correction model (SVECM) where two separate cointegrating relations for wages and prices are identified.
- An impulse response analysis is performed where the structural shocks are identified by taking into account the restrictions implied by cointegration and the weak-exogeneity properties of the system.
- Measures of persistence for real wages, wage and price inflation are computed using the impulse response functions.
Outline of the presentation

1. The theoretical model
2. The Econometric analysis
3. Conclusions
1- Theoretical model

- The model developed in the paper reduces to the following wage and price equations:

\[ w = (1 + \alpha)p - \alpha z + \delta h - \theta u \]  \hspace{1cm} (8)

\[ p = \beta (w - h) + (1 - \beta)z \] \hspace{1cm} (9)

These are the estimated “long-run” equations where:

- \( w \) = wages
- \( p \) = consumer prices
- \( h \) = productivity
- \( u \) = unemployment rate
- \( z \) = import prices
1- Theoretical model- “Reduced form”

- If we solve the model for wages and prices we get:

\[ w = z + \left( 1 - \frac{(1-\delta)}{1-\beta(1+\alpha)} \right) h - \left( \frac{\theta}{1-\beta(1+\alpha)} \right) u \]  \hspace{1cm} (10)

\[ p = z - \left( \frac{\beta(1-\delta)}{1-\beta(1+\alpha)} \right) h - \left( \frac{\beta\theta}{1-\beta(1+\alpha)} \right) u \]  \hspace{1cm} (11)

- If \( \delta = 1 \) we have

\[ w - p - h = -\left( \frac{\theta(1-\beta)}{1-\beta(1+\alpha)} \right) u \]  \hspace{1cm} (12)
2- Econometric Analysis

To see whether the model is consistent with the data we estimate a cointegrating VAR model in the variables $w$, $p$, $u$, $h$ and $z$, using quarterly data for the period 1992q2-2006q4 where:

- $w$ = Compensation per employee
- $p$ = Consumer price index
- $u$ = Unemployment rate
- $h$ = Labour productivity (ratio of real GDP to total employment)
- $z$ = Import price index (domestic currency)
2- Econometric Analysis

- We assume that the variables are I(1). This assumption is consistent with the results of the unit-root tests performed (Table 1).
- The assumption of two cointegrating vectors is consistent with the cointegration tests performed (Table 2).
2- Econometric Analysis

- In order to identify the wage equation we need to impose $\alpha = 0$ in eq. (8) (otherwise the rank condition does not hold).
- Imposing $\alpha = 0$ the model becomes over-identified with three over-identifying testable restrictions. When we estimate the model imposing such restrictions the coefficient of productivity, $\delta$, comes close to 1.
- Imposing this additional restriction we get a test with 4 over-identifying restrictions which is not rejected by the data (the bootstrapped p-value is 0.34).
2- Econometric Analysis

- Then we proceed by testing for weak-exogeneity of \( u \), \( h \), and \( z \) (for the parameters of the two cointegrating vectors), as well as, for the weak-exogeneity of \( p \) (for the parameters of the wage equation) and weak-exogeneity of \( w \) (for the parameters of the price equation).
  
  This implies 8 weak-exogeneity restrictions in the matrix of the loadings.

  The 8 weak-exogeneity restrictions together with the 4 over-identifying restrictions are not rejected at a 5% level, so we see our theoretical model as being consistent with the data.
2- Econometric Analysis

- We proceed by imposing the 8 weak-exogeneity restrictions jointly with the 4 over-identifying restrictions. We get for the wage and price equation:

\[ w = p + h - 0.057u \quad (16) \]

\[ p = 0.75(w - h) + 0.25z \quad (17) \]

with the loadings

\[ \gamma_w = -0.097 \quad ; \quad \gamma_p = -0.118 \]
2- Econometric Analysis – Identification of structural shocks

- The existence of 2 cointegrating vectors implies that the long run impact matrix is rank 3, which means that we must have 3 permanent shocks and 2 transitory shocks.

- To identify the three permanent shocks we have to impose three zero restrictions on the long-run impact matrix and to identify the 2 transitory shocks we have to impose one zero restriction in the matrix of the contemporaneous impacts.
2- Structural Analysis – Identification of structural shocks

- We identified the following 5 shocks:
  - **Permanent import price shock** is expected to have equal long-run impact on wages and prices leaving real wages unchanged in the long-run and thus, having no long-run impact on unemployment and productivity.
  - **Permanent productivity shock** is expected to be completed absorbed by wages in the long-run ($\delta = 1$), thus having no long-run effect on unemployment (and prices).
  - **Permanent unemployment shock** (may have non-zero long-run impact on all the variables)
  - **Transitory wage shock** (may have contemporaneous effects on both wages and prices).
  - **Transitory price shock** (no contemporaneous impact on wages).
3-Conclusions

- From the impulse response functions (which are depicted in Figures 3 to 7 of the paper) and from the computed measures of persistence we conclude that:

1) **Real wages are especially persistent following a permanent import price shock**, such that, only 53% of the total disequilibrium dissipates in the first two years after the shock. This compares to 66% in the case of a permanent unemployment shock, to 69% in the case of a permanent productivity shock.
3- Conclusions

2) Similar conclusions hold for wage inflation. Two years after the shock, only 31% of the total disequilibrium has dissipated in the case of an import price shock, compared to 51% in the case of the unemployment shock and 59% in the case of a productivity shock.
3- Conclusions

3) In contrast price inflation is more persistent following a permanent unemployment shock, as only 42% of the total disequilibrium dissipates in the first two years, compared to 53% in the case of an import price shock (the productivity shock has no significant impact on prices).

These results accord with intuition, because an import price shock impacts directly on domestic prices and only indirectly on wages, while an unemployment shock impacts directly on wages and mainly indirectly on prices through lower wages.
3- Conclusions

4) From the forecast error variance decomposition we conclude that at the business-cycle horizon (3-5 years), the variation in the forecast-errors of wages is attributable mainly to unemployment shocks (in about 80%) whereas variation in the forecast-errors of prices is attributable mainly to import price shocks (around 60%) and to unemployment shocks (around 20%). Productivity shocks explain somewhat less than 10% of the forecast errors in wages and prices.
Thank you