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Endogenous Employment Cycles in Euroland

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Abstract

The common European currency was introduced over seven years ago. Several subsequent beneficial developments have been documented, such as increased financial and goods market integration. However, problems have arisen due to fluctuations in real exchange rates and competitiveness. This paper demonstrates how the combination of a single currency, integrated goods markets and local labour markets can quite easily create cyclical wage/employment dynamics which are either non-stationary – limit cycles – or take a very long time to converge to equilibrium. In conclusion, it is shown how changing payroll taxes over the cycle may have a stabilising effect.

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JEL Classification: E24, E31, J23,

1. Introduction

The single European currency is now in its eight year. A rapidly expanding volume of research exploring this experience has cast light on the macro and microeconomic effects of the single currency. A number of positive developments have occurred in financial and goods markets. Considerable financial market integration has taken place (see Baele et al., 2006); interest rate differentials have decreased in the bond market; competition between financial intermediaries has increased; equity investors appear to treat Euroland as one marketplace; there is enhanced foreign direct investment (see Barr et al., 2003); and finally some of the countries, namely Greece, Portugal and Spain, have had significant current account deficits that have gone mostly unnoticed. In goods markets, intra-euro trade has increased by 5-15% (Baldwin, 2006) and trade has also increased with other countries; there is reduced price dispersion in case of the many tradable goods, such as electrical goods (see Allington et al. 2005), but limited in many other cases; and, finally, a much larger reduction in price dispersion has been documented in peripheral countries.

The bad news is that inflation differentials persist and these lead to real exchange rate movements that can threaten employment. These inflation differentials are ultimately caused

by differences in the rates of wage inflation.[1] Lane (2006) documents a real exchange rate depreciation for Germany in the period 1999-2004 (especially viz-a-viz its euro partners) and an appreciation for Italy (very strong against non-euro trading partners) as well as for Ireland, the Netherlands, Portugal and Spain. In this paper it is shown that such real exchange rate and employment cycles can arise easily when prices are set at the Euroland level while wages are determined domestically – goods markets are integrated while labour markets are not. The combination of a single currency, goods market integration and the absence of labour market integration[2] can thus prevent the labour market from settling down at its equilibrium rest point.

2. Employment and Inflation Cycles

The combination of integrated goods markets and local labour markets can quite easily generate a non-stable equilibrium in the labour market where periods of rising and falling wage inflation alternate. To simplify it is assumed that all goods are tradable and that their price P^T is exogenous to any one country:

(1) $$P_T = P_T^*$$

Moreover, it is initially assumed that labour supply is fixed

(2) $$L^s = \bar{L}^s$$

but later relax this assumption to allow for intra-euroland mobility.

We start with a production function for the representative (traded-goods) firm

(3) $$Y = AL^{\alpha}$$

which implies a labour demand function:[3]

(4) $$L^d = (\alpha A)^{1/1-\alpha}\left(\frac{W}{P_T}\right)^{-1/1-\alpha}$$

Denoting the number of firms by N, equation (4) gives an expression for the employment rate as a function of the level of competitiveness C, defined as $C=P/(W/A)$ and $\alpha'=\alpha^{1/1-\alpha}N$.

[1] Moreover, the introduction of the euro has contributed to price inflation by lowering real interest rates in periphery countries, hence causing house prices to increase and an ensuing construction boom; by making real interest rates fall as inflation has picked up; and because the countries respond differently to nominal exchange rate variations due to differences in the pattern of trade.

[2] It does not seem to be the case that the adoption of the euro has had a clear impact on the pace of structural reforms (see Elmeskov, 2005) nor has intra-euro labour mobility increased. However, overall mobility has increased because of the entry of the new EU member states.

[3] The assumption of perfectly competitive goods markets is implicit. Alternatively, we could have assumed imperfect competition in goods markets in which case we end up with a price setting curve.

(5) $$e = \frac{\alpha^{1/1-\alpha}\left(P_T/(W/A)\right)^{1/1-\alpha} N}{\overline{L}^s} = \frac{\alpha'}{\overline{L}^s} C$$

The employment rate *e* is a positive function of competitiveness so that when local labour costs *W/A* decline relative to the price of output – the country gains in terms of competitiveness – employment expands until again marginal cost equals price P^T.

Now turn to money wages. Following a long tradition – see Phelps (1968), Alchian (1969), Holt (1969) and Gordon and Hynes (1969) – we propose the following general wage curve

(6) $$\frac{W^*}{A} = \frac{W^e}{A^e}\left(1 - \beta(1-e) + z\right)$$

where *W** denotes the representative firm's desired (efficiency) wage – that is the warranted wage – W^e is the expected average wage for the *N* firms, *e* is the employment rate and *z* captures factors that make unemployment less onerous, such as the utility of leisure in case of search unemployment or the collection of state benefits that the unemployed are entitled to.

The equation says that a firm's desired wage differential is a positive function of the rate of employment and the term *z*. As employment expands it becomes increasingly difficult to maintain the higher level of employment because of workers' desire to spend time searching for better jobs, enjoy leisure or quit in order to look for better job opportunities. This is a greater problem – at a given level of employment – the higher the value of *z*.[4]

Expectations of wages and prices (alternatively wage and price inflation) are treated as a state variable affecting employment. What matters for output is the deviation of actual wages from their expected values. An expectational disequilibrium is created when unemployment is driven below its equilibrium level and firms experiencing higher quit rates respond by raising their wages, thinking that this will raise their wages in comparison to those of other firms. However, as expectations are disappointed wages are increased further until unemployment is back at its natural rate. The implication is that a monetary stimulus only has a short-run effect

[4] One way of viewing the labour market is to assume that firms and employees have to make their decisions before learning about the decisions made by others. This is related to the island parable of Phelps (1970) of an economy in which output is produced on separate islands, each having its own labour market. When wages and prices are set on one island this is done without the knowledge of what is happening on the other islands. When demand goes up due to looser monetary policy, individual producers do not realize what is happening and attribute the higher demand partly to the changed preferences of consumers and hence do not raise wages and prices immediately to neutralize any output effects. Only gradually do their expectations about prices and wages adjust which then gradually eliminates the output effects.

on employment and output; in the long run both are determined by the structure of the economy captured by *z* and β in the equation. This is the *natural-rate hypothesis*.[5]

2.1 Static expectations

We initially assume that the expected (efficiency) wage w^e is static, as is the level of expected productivity A^e. Taking logs gives

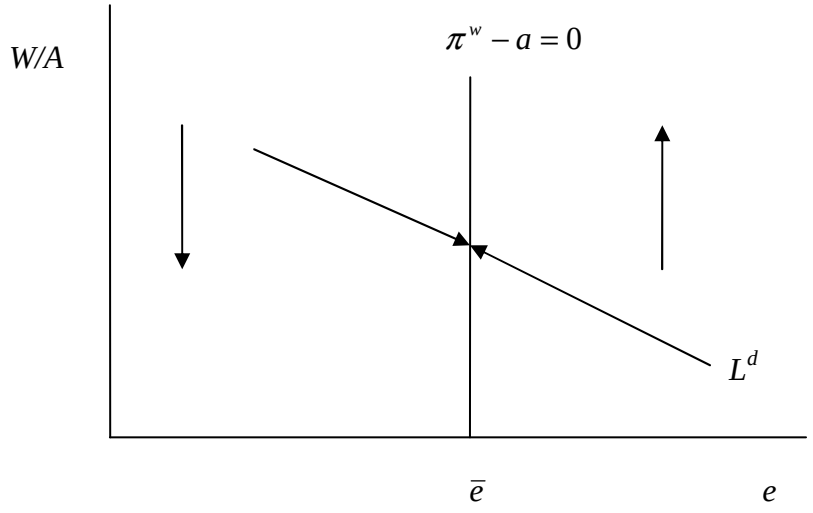
(7) $$\log W^* - \log W^e - a = \beta(e - \bar{e})$$

where $a = \left(A - A^e\right) / A^e$ and $\bar{e} = 1 - z/\beta$ is the employment rate in equilibrium when $W^*=W^e$. Clearly if $e > \bar{e}$ we get that $\log W^* - \log W^e > a$, and conversely if $e < \bar{e}$ we get $\log W^* - \log W^e < a$.

As all firms attempt to close the gap between actual and desired wages we get

(8) $$\pi^w = a + \beta(e - \bar{e})$$

It follows that when $e > \bar{e}$ wages are rising and employment falling while at $e < \bar{e}$ wages are falling and employment rising.



2.2 Backward-looking inflation expectations

One now relax the assumption of static expectations about wage levels and assume that expectations about future wages inflation are continuously revised and affect current wage setting

(9) $$\pi^w = a + \beta(e - \bar{e}) + \pi^{we}$$

[5] The policy implication that follows is that central banks must be concerned about the effects of their actions on inflationary expectations. If they reduce interest rates today, they may stimulate output and employment but at the cost of higher expected inflation – an upward shift of the short-run Phillips curve – which requires higher interest rates in the future, hence lower employment and output. Monetary policy becomes an inter-temporal planning problem (see Phelps, 1967 and 1972).

where π^{we} denotes expected wage inflation. Assuming inflation inertia and letting expected inflation equal past inflation[6] one can rewrite equation (9) as

$$\dot{\pi}^{w} = a + \beta\left(e - \bar{e}\right) \tag{10}$$

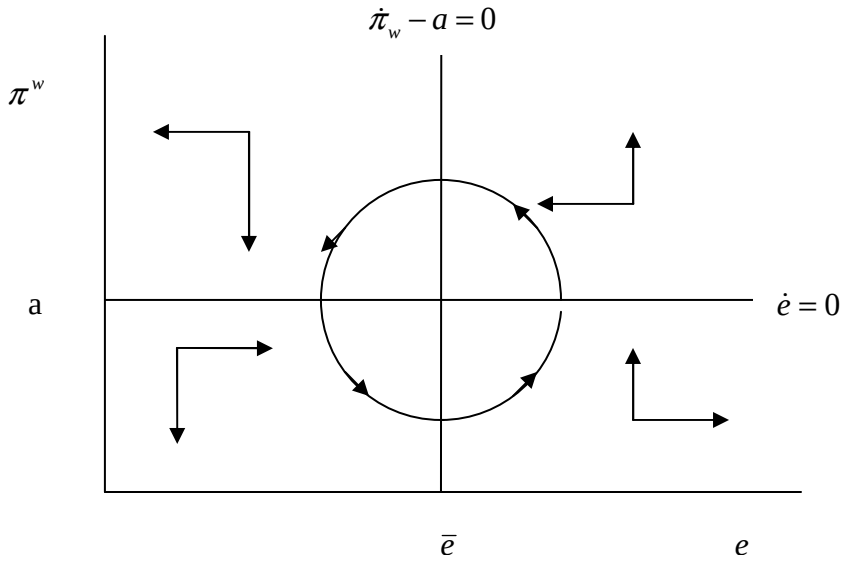
where $\dot{\pi}^{w} = d\pi^{w}/dt$. It follows that when employment exceeds its equilibrium level inflation is rising. Observed wage inflation rises when every firm raises its wages and this is soon reflected in expectations of higher wage inflation which makes each manager raise wages even more, hence further increasing wage inflation. The only non-inflationary point is at the equilibrium rate of unemployment where expected wages equal actual wages.

Now assuming a constant labour force L^s and a constant number of firms N and taking logs of the employment equation (5) above gives

$$\frac{\dot{e}}{e} = \frac{1}{1-\alpha}\left[a - \pi^{w}\right] \tag{11}$$

which is a non-linear differential equation in e.

To solve equations (10) and (11) together one needs a phase diagram in e and π_w. From the phase diagram we can see that the equilibrium is unstable and the economy goes in cycles around it.[7]



It follows that an economy that is price taker in goods markets – due to integrated goods markets and a single currency – while labour markets are national will, in the presence of

[6] Fuehrer (1997) tests the accelerationist Phillips curve against the new Keynesian one and finds that lagged (t-1) inflation does better at explaining current (period t) inflation than expected (t+1) inflation. An earlier paper by Ball (1994) also found support for inflation inertia and the accelerationist Phillips curve.

[7] The determinant of the Jakobian matrix for this system evaluated at the equilibrium (e,w)=($\bar{e}$, a) is $\beta/(1-\alpha)$ and the trace is equal to zero. This implies a limit cycle as shown in the figure.

(wage) inflation inertia, exhibit constant fluctuations of employment, wage inflation and real exchange rates. Periods of high employment, rising wage inflation and deteriorating competitiveness will be followed by periods of low employment, falling wage inflation and improving competitiveness.

3. Migration and stability

The supply of labour has so far been kept constant. This is in line with our initial assumption that while goods markets are integrated across countries, labour markets are not. However, migration can be added to the model to show how it affects stability.

Assume that immigration is a positive function of the rate of wage inflation

(12) $$L^s = L^s\left(\pi^w\right), \quad L^{s\prime}(\cdot) > 0$$

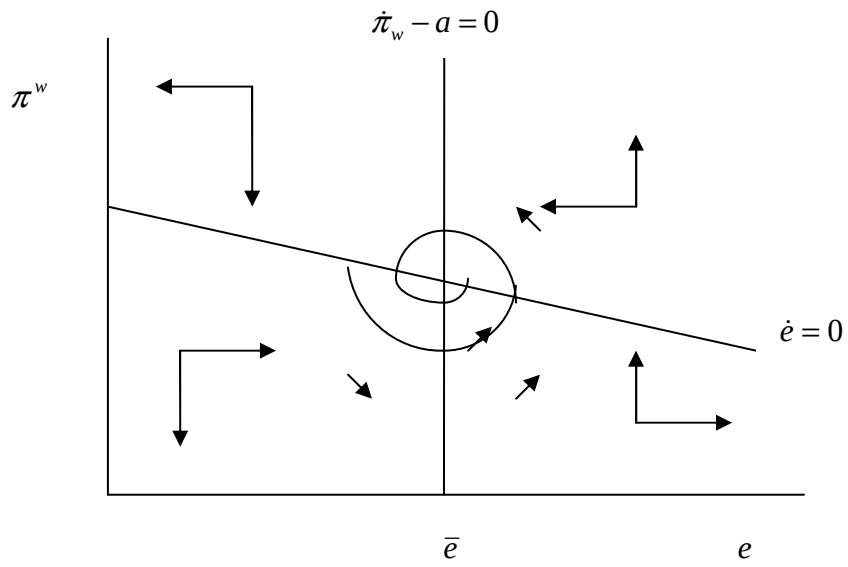
so that

(13) $$\dot{L}^s = L^{s\prime}\left(\pi^w\right)\dot{\pi}^w$$

In this case equation (11) changes to

(14) $$\frac{\dot{e}}{e} = \frac{1}{1-\alpha}\left[a - \pi^w\right] - \frac{L^{s\prime}\left(\pi^w\right)}{L^s}\dot{\pi}^w$$

which changes the slope of the $\dot{e} = 0$ schedule in the phase diagram[8] and the equilibrium becomes stable.



[8] The trace of the Jacobian is now negative implying stability. The trace is $-n - n'(\cdot) < 0$.

4. Fiscal policy

A payroll tax is now imposed on firms so that their gross wage payments per worker equal $w(1+\tau)$ where τ is the rate of payroll taxes. The employment equation can now in this case written as

$$e = \frac{\alpha^{1/1-\alpha}\left(P_T/\left(W\left(1+\tau\right)/A\right)\right)^{1/1-\alpha}}{L^s} \tag{15}$$

and our measure of competitiveness becomes

$$C^p = \left(P_T/\left(W\left(1+\tau\right)/A\right)\right)^{1/1-\alpha} \tag{16}$$

An increase in the domestic payroll tax will reduce competitiveness, hence also employment. Taking logs and then taking the time derivative gives

$$\frac{\dot{e}}{e} = \frac{1}{1-\alpha}\left[a - \pi_w - \dot{\tau}\right] \tag{17}$$

where $\dot{\tau}$ is the time derivative of τ. In steady state $\dot{e} = 0$ this gives

$$\pi_w = a - \dot{\tau} \tag{18}$$

In order to eliminate the limit cycle in the solution above one needs to have a policy such that payroll taxes are rising in the rate of wage inflation

$$\tau = \tau\left(\pi_w\right),\ \tau' > 0 \tag{19}$$

Since $\dot{\tau} = \tau'\left(\pi_w\right)\dot{\pi}_w$ we have in steady state $\dot{e} = 0$ that

$$\pi_w = a - \tau'\left(\pi_w\right)\dot{\pi}_w \tag{20}$$

which yields a downward-sloping streamline in the phase diagram and a stable solution. One can conclude that to eliminate the perpetual employment cycle, payroll taxes need to be adjusted so that positive wage inflation is met by rising payroll taxes. This implies that when employment is above its natural rate one raises payroll taxes in order to bring employment back to equilibrium and, similarly, when employment is below the natural rate one cuts payroll taxes in order to raise employment to its equilibrium value. In effect, countercyclical tax policy replaces countercyclical monetary policy in the case of a flexible exchange rate system in that an inflationary boom is met by the raising of payroll taxes which has the effect of reducing employment while a slump is met by cuts in the payroll tax intended to raise employment.

5. Conclusions

The combination of a single currency, an integrated goods market and a non-integrated labour market can yield perpetual fluctuations in real exchange rates and employment when there is wage-inflation inertia. These cycles call for a countercyclical fiscal policy that brings the economy back to its natural rate of employment and the equilibrium real exchange rate. A suitable form of fiscal policy would have the effect of raising the cost of labour during economic booms and lowering it when employment contracts.

References

Alchian, Armen, "Information Costs, Pricing and resource Unemployment," in Edmund S. Phelps et al. (eds.), *Microeconomic Foundations of Employment and Inflation*. New York: WW Norton.

Allington, Nigel F.B., Paul A. Kattuman, and Florian A. Waldemann (2005), "One Market, One Money, One Price? Price Dispersion in the European Union," *International Journal of Central Banking*, 1(3), 73-116.

Baele, Lieven, Annalisa Ferrando, Peter Hördahl, Elizaveta Krylova, and Cyril Monnet (2004), "Measuring Financial Integration in the Euro Area," ECB Occasional paper no. 12.

Baldwin, Richard E. (2006), *In or Out: Does It Matter? An Evidence-Based Analysis of the Euro's Trade Effects*. Centre for Economic Policy Research, London.

Ball, Laurence (1994), "What Determines the Sacrifice Ratio?" In N.Gregory Mankiw, ed., *Monetary Policy*, 155-182. Chicago: University of Chicago Press.

Barr, David, Francis Breedon, and David Miles (2003), "Life on the Outside: Economic Conditions and Prospects outside Euroland," in *EMU: Assessing the Impact of the Euro*, Richard E. Baldwin, Guiseepe Bertola, and Paul Seabright (eds.). Oxford: Blackwell Publishing, 281-321.

Blanchard, Olivier (2006), "Adjustment within the euro: The difficult case of Portugal," Working Paper, MIT.

Fuehrer, Jeffrey C. (1997), "The (Un)Importance of Forward-Looking Behavior in Price Specificaitons," *Journal of Money, Credit and Banking*, 29, 338-350.

Gordon, D. F. and A. Hynes (1970), "On the Theory of Price Dynamics," in Edmund S. Phelps et al. (eds.), *Microeconomic Foundations of Employment and Inflation*. New York: WW Norton.

Holt, C. C. (1970), “Job Search, Phillips’ Wage Relation and Union Evidence: Theory and Evidence,” in Edmund S. Phelps et al. (eds.), *Microeconomic Foundations of Employment and Inflation*. New York: WW Norton.

Lane, Philip R. (2006), “The Real Effects of European Monetary Union,” *Journal of Economic Perspectives*, 20(4), 47-66.

Phelps, Edmund S. (1968), “Money-Wage Dynamics and Labor-Market Equilibrium,” *Journal of Political Economy*, 76(4), 678-711.

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