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IRELAND IN EMU: MORE SHOCKS, LESS INSULATION?

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ABSTRACT

Ireland in EMU: More Shocks, Less Insulation?*

Despite anchoring the Irish monetary system to a common zone-wide exchange rate and interest rate, EMU has triggered sizable exchange rate and especially interest rate shocks to the Irish economy (albeit not appreciably greater than those experienced under previous exchange rate regimes). Interest rate movements have deviated widely from what a standard Taylor monetary policy rule would have counselled - though here again the deviations have been no worse in this regard than those of the previous regime. The most important shock has been associated with the large and sustained initial fall in nominal interest rates as EMU began. Through mechanisms which we formally model, the interest rate fall has had a lasting effect on property prices, construction activity and on the capacity of the labour market to absorb sizable net immigration, despite a sharp deterioration in wage competitiveness since 2002. As the long drawn-out impact of this shock subsides, the failure of the wage-bargaining system promptly to claw back the loss of competitiveness resulting from exogenous exchange rate movements is increasingly likely to show up in weaker aggregate employment performance.

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Submitted 25 October 2005

IRELAND IN EMU: MORE SHOCKS, LESS INSULATION?

Introduction

Has Ireland's entry into EMU in 1999 tended to destabilize the economy? It could have done so in two ways, first by increasing the scale and frequency of exogenous shocks hitting the economy, and second by suppressing some shock absorbers in the system, placing more pressure elsewhere. In both cases, the focus is on exchange rate and interest rate movements.

Prior to EMU entry, the nominal interest rate in Ireland was endogenous in the national economy and subject to national policy influence – as indeed was the nominal exchange rate to some extent. As such, they could in principle represent a fast-adjusting part of the system's adaptive capacity. Now, in EMU these key variables are exogenous and cannot be relied upon as a lubricant, to move in a stabilizing manner when the Irish economy is hit by idiosyncratic shocks. Not only that: there is also the potential for exogenous movements in interest rates and in the effective exchange rate to operate as destabilizing forces.

This concern is no longer an abstract one. Indeed the first years of the new system, marked by extremely rapid real economic growth, and by a decline in unemployment to record lows, also saw a sharp procyclical decline in real interest rates and in the effective exchange rate index.

Shocks which are not absorbed by insulating interest rate and exchange rate movements, or which are the consequences of destabilizing movements in these rates, can be expected to show up in other prices or in quantities.[1] The major elements here include real wage rates, unemployment and migration, in property prices and construction activity, and – an element largely ignored in this paper – fiscal aggregates. Of these, migration and property prices tend to be neglected in the international macro-adjustment literature, but they have clearly been important in Ireland (cf FitzGerald, 2001, Leddin and Walsh, 2003).

Of course, there are channels through which EMU membership can have had a stabilizing effect. Expectations of exchange rate movements and medium term inflation – previously a source of instability[2] – have become insensitive to domestic developments.

The paper looks both at whether the exogenous exchange rate and interest rate have had the effect of increasing the scale and frequency of exogenous shocks hitting the Irish economy, and at how key variables in the remainder of the economy – the share of construction in total employment, house prices, inward migration and labour competitiveness – have responded to the largest of these shocks.

We find that exogenous exchange rate shocks to the Irish economy are sizable, but not much more so than under previous regimes. We confirm that interest rate movements have not moved in line with a stabilizing monetary policy for Ireland – though again the deviations have been no

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[1] Although, as pointed out by Flood and Rose (1995) there has been little empirical evidence that fixing exchange rates increases the volatility of real variables.

[2] For two decades pre-EMU such expectations were on average for a higher-than-realized depreciation and surged in response to certain configurations of domestic and international shocks (Honohan, 1993; Honohan and Conroy, 1994).

worse in this regard than those of the previous regime. The most important shock has been associated with the large and sustained fall in nominal interest rates. This has been reflected in property prices, construction activity and the capacity of the labour market to absorb sizable net immigration, despite a sharp deterioration in wage competitiveness since 2002.

Section 1 contains a brief general overview of Ireland's experience to date in EMU, highlighting the key exogenous shocks – the initial fall in interest rates, the two-way swing in the external value of the euro, and the international slow-down following the bursting of the technology bubble – and the response of the Irish economy, with sustained migration, continued house price inflation and only a modest dip in real output growth. Section 2 assesses the impact of the change in exchange rate regime on the nature and magnitude of exogenous shocks, looking separately at exchange rate and interest rate movements. The next two sections consider the endogenous (market) response of other key domestic variables to these and other shocks. Using a simple algebraic model of short-run dynamics, Section 3 illustrates the potential role of migration and the property market in amplifying and prolonging the impact of shocks such as the initial interest rate decline. Section 4 proceeds to look at the empirical evidence for these two price and quantity adjustments in two key markets: for residential property and for labour documenting in particular the continuity in the relation between cross-channel unemployment differences and migration and focusing on the evolution of labour competitiveness – where we find that wage determination has not been a stabilizing force either. Section 5 contains concluding remarks.

1. Overview of Ireland's experience in EMU

1.1 The regime change

Following a period of controlled floating within the very wide ERM bands (1993 to 1998), Ireland dissolved its independent currency in the single euro currency of the multi-country European Monetary Union in January 1999. Thus at the time of writing, Ireland has had no independent currency for nearly seven years, or about half as long as the lifetime of the narrow-band ERM (1979-1992). This is a period sufficiently long to begin to provide some information about the magnitude of shocks and the economy's reaction to them.

In terms of the macroeconomic policy environment, abandonment of an independent currency entails the removal of two policy instruments, the nominal interest rate and the exchange rate, both of which could be used to offset shocks. It should, however, be borne in mind that both variables could be subject to suboptimal policy, whether because of technical failings or because of inherent problems of time inconsistency.

The particular choice of alternative currency also matters: if the adopted currency proves stable against the main trading partners, then shocks induced by third-country exchange rate movements will be minimized. In the case of the euro, all exchange rate shocks are clearly reduced against other countries using the euro and those adopting a fixed peg against the euro. However, much of Ireland's trade and financial affairs are with countries that have not adopted or pegged to the euro, most notably the UK, the US (together with countries pegged de facto with the US dollar including up to 2005 China – now Ireland's third largest non-EU trading partner) and Japan.

The preconditions for Ireland's adoption of this regime were not unambiguously favorable. While the conjunctural situation at the outset was quite good, with unemployment falling, the public finances in surplus and cost-competitiveness conditions favorable[3], the structural pattern of trading and investment relations was much less so, with only 19 per cent of merchandise imports and 42 per cent of exports coming from initial EMU members in 1998.[4]

A clear and crucial initial impact, making itself felt before the exchange rates were irrevocably locked, was the sharp once-for-all drop in nominal interest rates. As will be discussed, this has had a decisive and long-lasting effect on subsequent macroeconomic developments.

1.2 World conjunctural changes and Ireland's response, 1999-2004

At first sight, and in terms of the average major macroeconomic indicators, Ireland's experience in EMU has been an unalloyed success: real GNP growth has averaged 5.7 per cent per annum, average unemployment was 4.4 per cent, the current account balance of payments deficit has averaged less than 1 per cent of GDP per annum and even inflation – clearly the least successful area of the four – can be considered moderate, with the CPI growth coming in at 3.7 per cent per annum on average.

Admittedly, this average data tends to gloss over the activity slowdown from the heady growth rates and falling unemployment of 1999-2000 – which may be considered the last two years of the Celtic Tiger (Leddin and Walsh, 2003) – to the more modest, but still respectable, output and employment achievements of 2001-4 (Figure 1).[5] The growth slowdown can be related to the series of shocks, external and internal, which hit the economy from mid-2000. Among the shocks were the peaking of the dot.com bubble, followed by the US recession and reduced growth in most EU markets, the aftermath of the 9/11 events and the run-up in commodity prices, especially petroleum; an additional, more local, factor was the foot-and-mouth disease outbreak in 2001 with consequences for agriculture and tourism. Annual inflation too, displayed a cyclical pattern, surging to a high of 5.6 per cent in 2000, fuelled by the rise of the US dollar and sterling against the euro, before falling to about 2 per cent by 2004.[6]

[3] So favorable, indeed, that a small – and perhaps inadequate – upward revision in the ERM central rate had been engineered in the months preceding EMU's start, in an attempt to ensure that the irrevocable conversion rate would not be so undervalued as to contribute to unwanted imported inflation in the early years of the union.

[4] Interestingly, the first six years of EMU showed a small decline in this percentage for exports, and only a modest increase to 21 per cent for imports. Instead, the share of the US in Ireland's exports continued to expand and that of the UK to decline. Of course the pattern of trade is strongly influenced by the near-entrepôt character of much of the pharmaceuticals and IT-related trade (Honohan and Walsh, 2002) and the trade pattern of export-related value-added is in particular quite different (cf. Baker, 1996).

[5] Even in 2002, real GNP growth was as high as 2.7 per cent and by 2003 it had recovered to 5.1 per cent before slowing somewhat to 4.0 per cent in 2004, still close to likely long-term potential growth. However, unemployment started rising for the first time in a decade. Interpretation of the macroeconomic aggregates is complicated by some sharp revisions in these annual growth rates between successive issues of *National Income and Expenditure*, and of course there is the continuing difficulty of interpreting the level and especially the annual changes of net factor income. Data on trends over 2-3 years may be more stable and reliable.

[6] The currency movements had a larger effect on Ireland than on any other EMU country, because of the relatively close trade and investment links (Honohan and Lane 2003; 2004)

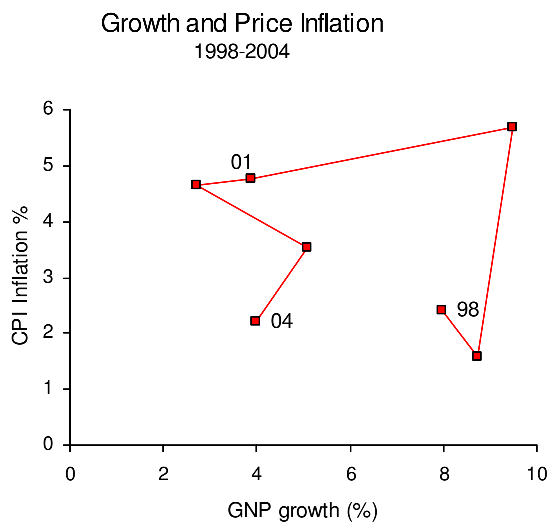

Figure 1: *Growth and Inflation in EMU: Ireland 1998-2004*

This mild nature of the slowdown and the subsequent speedy recovery – albeit not to "Tiger" levels – seems to suggest that one of the main anticipated costs of EMU entry, the fear of "prolonged recession" and the inability to adjust to asymmetric shocks, were not entirely justified. The interesting question, however, is whether the recovery was due to the efficient working of internal policy or market mechanisms or rather to fortuitous external or domestic factors?[7]

This paper will not attempt a detailed discussion of countercyclical fiscal policy, but it would clearly be hard to argue that fiscal policy was actively stabilizing. Although loss of the nominal instruments is generally held to create a need for heavier reliance on countercyclical fiscal policy, this lesson does not seem to have been put into effect in Ireland so far. Irish fiscal policy has been largely pro-cyclical during the EMU years as the government tended to expand spending in line with revenue during the boom years and curtail spending during the downturn. Indeed, with the reversal of the dollar and other adverse shocks, Ireland finds itself with less fiscal leeway than if it had held a tight belt in the over-heating period 1999-2000.

2. Interest and exchange rate shocks: have they increased in the new regime?

Prior to EMU entry, the major predicted change was a decline in the average level and volatility of real interest rates and the danger of an increase in the trade-weighted exchange rate – at least relative to other available exchange rate regimes. In this section we show that exchange rate volatility has not clearly increased and that, though nominal interest rate volatility has fallen, the interest rate has not proved to be a stabilizing force.

2.1 Third country exchange rate movements

[7] A graphical presentation of some of the potential adjustment mechanisms is in Leddin (2004).

Use of the euro stabilizes Ireland's nominal exchange rate but only against partner countries that make up a minority of trade. Given that the euro's exchange rate against third countries is negligibly affected by Irish conditions, the first question is whether this has resulted in a more or less volatile trade-weighted nominal[8] exchange rate in practice and whether it has been associated with a more or less appreciated nominal exchange rate on average.

Figure 2 displays a long time series of the nominal effective (trade-weighted) exchange rate index (NEER),[9] from which it is evident from that this slipped to record low levels during the run-up to, and the first two years of EMU. Since 2002, however, it has recovered sharply to reach levels last recorded in 1997. So far, then the new exchange rate regime has delivered in nominal terms a weaker exchange rate on average (index of 62.0) than previous regimes (ERM narrow band: 67.4; ERM wide band: 66.5). (The opposite is true of the real exchange rate, as will become evident below).

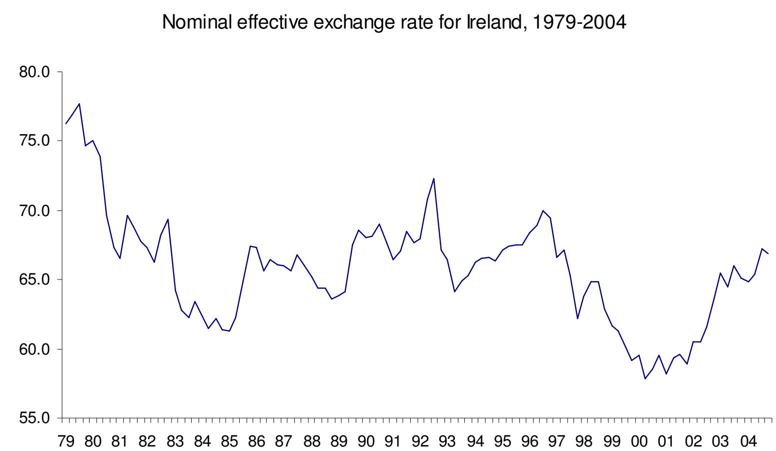

Figure 2: *Nominal effective exchange rate for Ireland 1979-2004*

The evolution of volatility can be measured in various ways. We discuss two representative measures of the volatility of the nominal trade-weighted exchange rate index: standard deviations of the quarterly level and of the change (first difference) of the index. Figure 3a, plots a twelve-quarter moving standard deviation of each and illustrates the fact that there have been several waves of heightened volatility over the years.

Measured in terms of standard deviation of levels,[10] there have been two surges in Irish nominal trade-weighted exchange rate volatility during EMU and, as shown in the Figure, these were as high as anything experienced for almost a quarter century. Measured separately for the three regimes, the narrow band period proves to have the highest standard deviation at 4.1 per cent –

[8] It is the nominal exchange rate that is treated as the shock, the real exchange rate, embodying endogenous adjustments in, for example, wages is treated in Section 4.
[9] Until mid-2002 (when it was discontinued) the plot shows the Bank of England's series (average of the last month of each quarter). Thereafter we use the Central Bank of Ireland's trade-weighted competitiveness index (nominal).
[10] Arguably, since high frequency exchange rate movements can be hedged in financial markets, it is the low frequency movements, with a wavelength of some years, which are most problematic for disturbing macroeconomic equilibrium, and these are better captured by the levels data than by the changes.

reflecting the many realignments – the wide bank period has the lowest at 2.3, with EMU so far intermediate at 3.2.

Measured in terms of changes, volatility during EMU has been lower than at most periods in the past. This standard deviation over the EMU period comes out at 1.2 per cent, as compared with 1.3 for the wide-band ERM period and 1.7 for the narrow band (1.4 if the realignments are removed – see below). However, for the other small EMU countries, the reduction in NEER volatility following EMU entry has been much more striking [11]

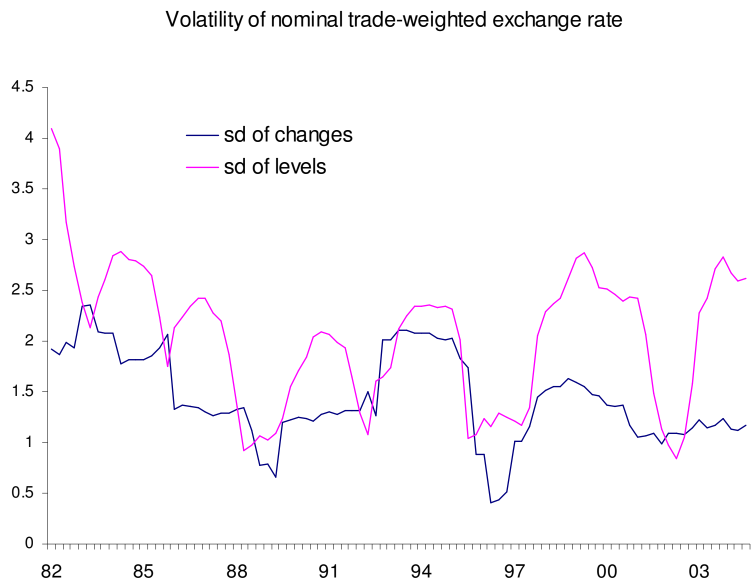

Figure 3a: *Volatility of nominal trade-weighted exchange rate*
(Source: exint.xls)

Modeling the evolution of the exchange rate as a random walk with time-varying variance (GARCH model), with dummies in the variance process model for different regimes, suggests that, while variance may have been somewhat higher in ERM, it is not significantly lower in EMU period. Of course, as shown in the representative results reported in Table 1, the fit of any such equation is very poor, and even the ERM dummy in the variance equation is not significant even at the 10 per cent level.

Overall, this evidence suggests that high frequency nominal exchange rate volatility has not been higher in EMU (and might seem even to have been somewhat lower). An important additional consideration must be borne in mind. Some of the volatility in pre-EMU times reflects realignments[12] in which the exchange rate was consciously adjusted in a stabilizing way. These

[11] Indeed, for the other small EMU countries: Austria, Belgium, Finland, Greece, Netherlands and Portugal, using the moving 12-quarter standard deviation of (log-)changes as the benchmark, the most recent volatility (to end-2004) is at or close to (less than 44 per cent above) the minimum observed 1981-2004, whereas for Ireland the latest observation is at more than 130 per cent above the minimum.

[12] Also related to realignments is the fact that the change in exchange rate is negatively skewed (-0.68) in the full period, but not in the EMU period, when skewness is close to zero (+0.06). The skewness in the ERM period presumably reflects the negative jumps at times of realignment. These tend to increase measured variance in the

movements cannot be considered as shocks, but rather as corrective adjustments. So some of the volatility in changes in the ERM is "good" volatility. Indeed, removing the exchange rate changes in the quarters of the three largest realignments for Ireland (March 1983, August 1986 and January 1993) rather dramatically alters this picture and removes the most of the apparent reduction in volatility since EMU began (Figure 3b). We look at this in more detail below in the discussion of competitiveness.

Table 1: *A time-varying variance (GARCH) model of the exchange rate, 1979Q1-2004Q4*
Dependent variable is change in nominal effective (trade-weighted) exchange rate index

	1		2		3	
	Coeff	*t*	Coeff	*t*	Coeff	*T*
Main equation						
Constant	-0.085	0.2	-.030	0.2		
DumERM	-0.076	0.2				
DumEMU	0.199	0.4				
Lagged Depvar	0.163	1.6				
*DumERM			0.195	2.2	0.200	2.5
*DumEMU			0.068	0.3		
Variance equation:						
Constant	2.44	1.6	2.03	3.2	2.03	3.6
ARCH(1)	-0.107	2.1	-0.100	1.0	-0.094	1.3
GARCH(1)	-0.233	0.3				
DumERM	1.327	1.1	1.011	1.5	0.874	1.4
DumEMU	-0.430	0.4	-0.412	0.4	-0.414	0.5
Sample	79:3-04:4		79:3-04:4		79:3-04:4	
RSQ/DW	0.009	2.06	0..004	2.01	0.002	1.99

Source diffef ev results.doc

quarterly data, whereas they are absent from EMU, and are likely the main reason why variance increases in EMU when measured in levels but not when measured in changes.

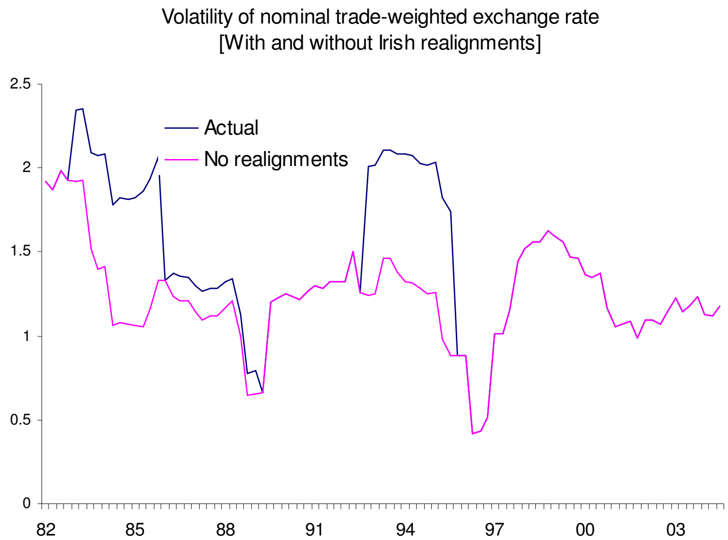

Figure 3b: *Volatility of nominal trade-weighted exchange rate*
(based on changes, with and without realignments)

On balance, then, the data do not point to an improvement as between EMU and previous regimes in regard to exchange rate volatility. This is despite the elimination of bilateral exchange rate changes with all the EMU members, and despite the expectation of some that exchange rate volatility would decline in net terms. Ireland certainly did not benefit from the sizable reduction in exchange rate volatility experienced by other EMU members with the arrival of the new regime. On the other hand, it is hard to point to evidence of a major increase in volatility emanating from this source.

2.2 Interest rate levels and dynamics: have they become less stabilizing?

Over the period 1999-2004, the average real interest rate in Ireland was –0.9 per cent. Adding to the effect of the sharp decline in nominal interest rates here was the rise in inflation during 1999-2002. Spurring, as it did spending especially in the construction sector, the fall in nominal rates itself likely contributed to inflation. The experience dramatically illustrates how the adoption of an exogenous nominal interest rate not only removed the potential for this instrument to be used as a countercyclical tool, but also induced a pro-cyclical element because of the fact that, absent a policy response, a rise in inflation automatically generates a fall in real interest rates.

Now that nominal interest rate movements are externally determined, movements in them represent shocks to the system; but have they become more stabilizing or more destabilizing on average? This question can be divided in two[13]: First, how far have movements in the nominal interest rate differed from what would have been adopted had an autonomous monetary policy been in effect? Second, how procyclical have real interest rates become with the fixed parity and passive exchange rate policy?

[13] A third relevant question is whether the volatility of real or nominal interest rates has declined. Here the empirical answer is clear: there has been a decline in nominal interest rate volatility in the EMU period. Real interest rate volatility was, however, lowest in the floating rate period 1994-98.

One natural approach to answering the first question is to compute the optimal interest rate policy, given inflation and real economic conditions, and compare with the actual. The widely used Taylor rule is a useful first approximation here.[14] This is a simple formula setting the nominal short-term interest rate as a linear function of inflation rate and the output gap.

$$i_t = \alpha + \beta(\pi_t - \pi^*) + \gamma(y_t - y^*)$$

When inflation exceeds its target value, the interest rate is increased; if the output gap is negative, it is reduced. In this equation, π_t and y_t are either the current values, or the authorities' projected future values for actual inflation and the output gap. In addition, there may be smoothing: with the authorities preferring not to jump immediately to the interest rate indicated by the equation.

The Taylor rule does not necessarily define a true optimal interest rate: it neglects, for example, the fact that the authorities will often hike interest rates to defend a fixed-but-adjustable exchange rate peg. It is best thought of as a useful benchmark summarizing the combined demands of output and inflation stabilization on the monetary authorities. Using the formula to deduce the benchmark requires several practical decisions. First we need to know the parameter values; second, we need to know what data is available to the authorities regarding current and projected inflation and output gap, and whether smoothing is carried out.[15] There is also the issue of whether producer or consumer prices are more relevant.

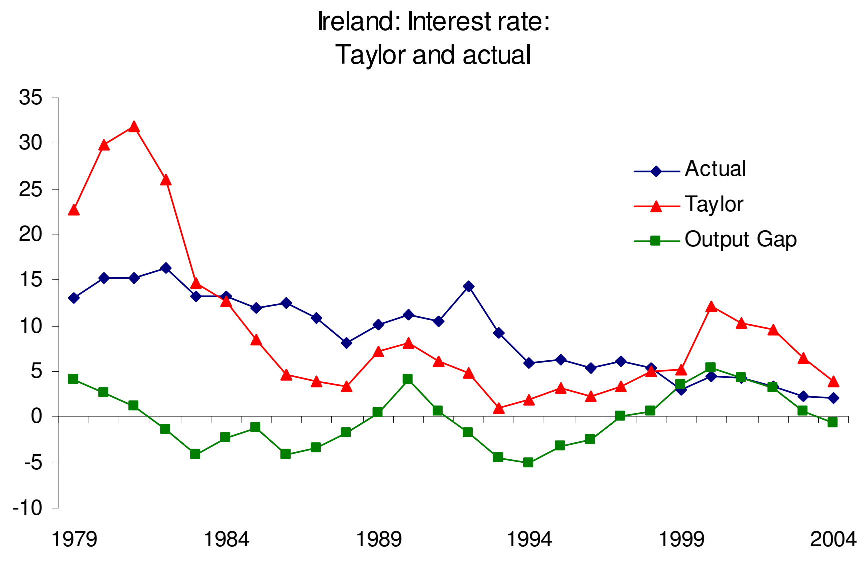

Figure 4: *Nominal interest rates: actual and warranted by Taylor rule*
(based on short-term interest rate and output gap series from OECD Economic Outlook 77, June 2005; using parameters $\alpha = 4$; $\beta = 1.5$; $\gamma = 0.5$).

[14] See Adalid et al. (2005) (for the Euro area), Conley and Dupor (2004) (for the US) and Kuttner (2004) as examples of the many recent attempts to compare actual interest rate movements to Taylor rule predictions.
[15] These issues are well presented in Faust et al. (2001) whose Taylor rule also implied that Ireland's actual interest rates were too low in 1999-2000.

Figure 4 shows a representative Taylor rule interest rate computed using contemporaneous values of CPI inflation and the OECD output gap, conventional parameter values, and no smoothing.[16] The main features are that the Taylor interest rate is much higher than actual before 1984; it then dips below the actual and remains there until 1998. In the EMU period Taylor's formula generates much higher interest rates for Ireland than were actually observed. This long swing, interest rates too low before 1983, too high between then and the EMU, and too low since is neither quantitatively negligible, nor highly sensitive to the assumed parameters of the Taylor rule. The Actual and Taylor plots cross at just two points, which thus define three interesting subintervals. The swing in the difference between actual and Taylor values is from an average of *minus* 1254 basis points before 1979-1982; *plus* 430 basis points 1983-97; and *minus* 400 basis points 1998-2004. We have used Taylor's original parameters, but experiments with a range of parameter values proposed in the literature reveal that the qualitative features persist through a wide range of parameter values (Table 2).[17]

Figure 4 suggests two complementary conclusions. First, by this reckoning nominal interest rates in EMU have been far too low for Ireland, allowing inflation to surge despite strong output performance. But, the second conclusion suggested by Figure 4 is that nominal interest rates missed the mark by at least as wide a margin in the earlier periods also.[18] Was monetary policy inappropriate then also, albeit in the opposite direction, with interest rates too high during the later part of the ERM period? Excess returns against the anchor currency of that adjustable peg exchange rate regime averaged over 2 percent per annum for two decades, surging when the exchange rate peg was being protected against short-term realignment speculation, and remaining high in calmer times also (Honohan and Conroy, 1993). Real interest rates were much higher too, as illustrated in Figure 5.

Table 2: *Taylor rule less actual short-term interest rate, various periods, Ireland*

Parameters as used by:	β	γ	1979-82	1983-97	1998-2004
Taylor (1993)	1.5	0.5	-12.54	4.30	-4.00
Honohan-Lane (2003)	1.5	0.125	-12.25	3.57	-3.08
Fed St Louis (2002)	1.248	0.853	-8.64	5.43	-4.47
Fed St Louis (2002)	1.846	1.073	-18.74	4.79	-5.93

Quarterly data from the sources used for Figure 4. The target long-term nominal interest rate α is set at 0.04

Of course the Taylor rule calculations relate closely to the dynamics of real interest rates and how they varied with inflation. If a Taylor rule (with greater than unitary response to inflation) is employed, real interest rates will act in a stabilizing manner with regard to inflation (subject to the output gap). On the other hand, the exogenous nominal interest rate generated for Ireland by EMU membership could induce a destabilizing or procyclical real interest rate dynamic unless

[16] The figure is based on Taylor's original (1993) parameters. A very similar result is obtained for quarterly data, using the average inflation over the previous four quarters.

[17] Appendix 1 shows that Ireland has the distinction of a higher variance in the gap between Taylor rule and actual interest rate than any of the other twelve small countries for which the same data is available, other than Greece. Furthermore, Irish interest rates have averaged further below the Taylor rule value than in any other of these countries since the EMU began.

[18] This statement hinges on the vakue of the intercept α, assumed to 4 per cent, a value which results in the average gap between Taylor and actual of close to zero. Regardless of the exact value of the intercept we may say that either interest rates were too high before, or too low, since EMU began, or both.

the inflation correlation of Ireland with the rest of the EMU zone to Ireland is sufficiently close. In order to examine which of these polar opposites more closely fits the Irish data in the years just before and since EMU we ran some simple and standard regression estimates of a Taylor-type equation; representative results are presented in Table 3. Whereas the discussion above referred to the average interest rate level over a period of years, this estimation focuses on the short-run response of interest rates to inflation and the output gap.[19]

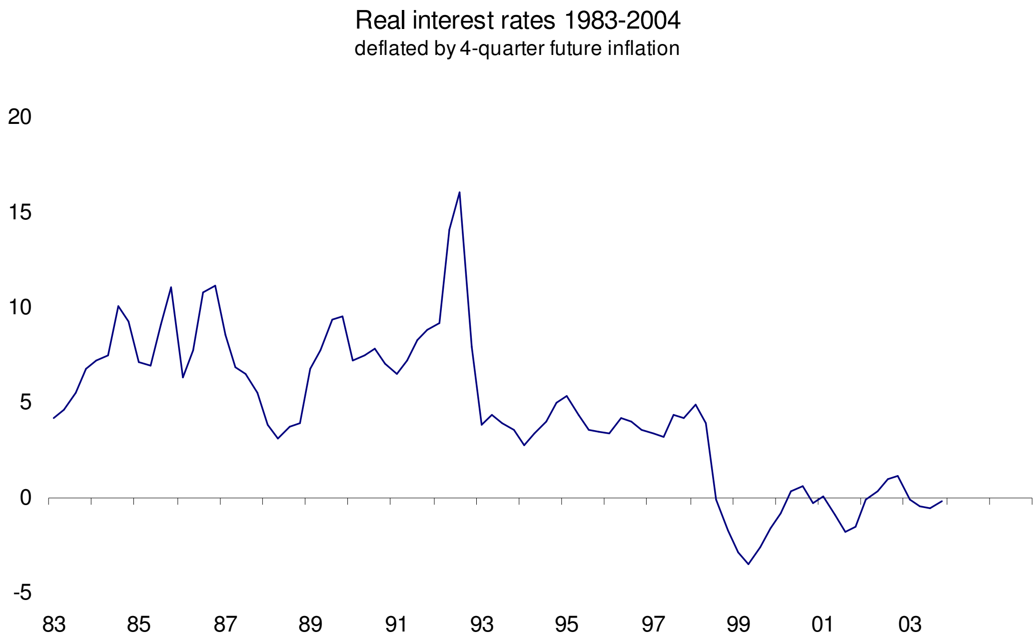

Figure 5: *Ireland: Real Interest Rates 1983-2004 (deflated by 4-quarter future inflation)*
(Source: Based on data from Central Bank of Ireland Quarterly Bulletin exint.xls)

When the Taylor equation is estimated over the whole period since the ERM crisis of 1992-3, neither inflation nor the output gap is significant (Regression 2).[20] If a second order autoregressive process is added, some significance is obtained (Regression 3), but the major explanatory power comes from the autoregression, and the estimated value of the coefficients β and γ is low. As shown in Appendix 1, the low value of the inflation response β in particular (less than 0.4) contrasts with the experience for other small countries, as indicated by a panel regression of the same form. These regressions provide little indication that interest rate movements in Ireland have responded to inflation and output gaps in a manner consistent with a stabilizing monetary policy as measured by Taylor's rule.

[19] As have others, we find that the basic equation exhibits serial autocorrelation which others have interpreted as either reflecting smoothing behaviour (which would be consistent with inclusion of the lagged interest rate) or omitted variables.

[20] Regression 1 in Table 3 shows that, In the narrow band ERM period, before the crisis of 1992-3, inflation was significant, with an estimated long-term adjustment coefficient β of 0.4. But for this period, defense of exchange rate peg was an important influence on interest rate policy. Indeed, in the narrow-band period there was a positive correlation between real exchange rate appreciation and the level of the real interest rate – a correlation which no longer prevails.

Looking separately at the wide-band ERM period,[21] inflation and the output gap are once again not significant unless autoregressive terms are included. If we do include autoregressive terms, then inflation and output gap become significant, though again with a small inflation response coefficient, the highest estimated value of β being the 0.88 of Regression 6). Once again this contrasts with the results from a panel of small countries (Appendix 1).

In the EMU period both inflation and output gap are significant. As we know that Irish macroeconomic conditions negligibly affect ECB policy, the significant coefficients here may be considered as induced from the correlation with EMU-wide conjunctural conditions. For Ireland in EMU this equation can at most be described as a pseudo- or "as if" Taylor rule. Higher Irish inflation and higher Irish output (actually output gap) were actually associated with an increase in interest rates, even though the Irish data were not driving the policy. Curiously, then, interest rate movements during EMU can be as easily – or even more easily – be interpreted as moving in a counterinflationary and countercyclical way on average. However, for the EMU period also, the estimated coefficients are too small to imply a vigorous counterinflationary policy response. While the estimated value of the output response coefficient γ at about 0.2-0.3 is within the range discussed in the literature, the response to inflation $\beta = 0.3$, is well below unity (Regressions 7-10).

Before rushing to the conclusion that neither before nor since the beginning of EMU has monetary policy been sufficiently stabilizing, there are some caveats. For one thing, the inflation surge of 2000-3 was over by 2004 and at the time of writing inflation is down to the region of 2½ per cent. In retrospect the sharp upward jag in policy rates advocated by the Taylor Rule (to over 14 per cent by the end of 2000) would surely have been an overreaction. This alerts us to the possibility that the relative weight given to inflation and output gap in the Taylor rule parameters may be inappropriate for an environment where medium-term inflation stability is guaranteed by the nominal anchor of using an external currency. Perhaps a lower relative inflation sensitivity would be tolerable in such an environment, though this would depend on the implications for future output gap of tolerating a larger interim inflation, and on the elasticity of inflationary expectations. Given that drift in the price level must ultimately be reversed it may be more important to avoid an initial deviation because of the future cost in output gap as inflation readjusts. On the other hand, a lower elasticity of inflation expectations (less danger of an inflation psychology taking grip) may make the reversal of a price blip less costly in output terms.

This section has measured exchange rate shocks to nominal exchange rates in terms of standard deviations of the NEER, and interest rate shocks in terms of their deviations from a Taylor rule. Anyone who thought EMU would bring a substantial improvement on either of these fronts will find little comfort in the data. It would be hard to argue, though that either source of shock has markedly increased, with the one important exception of the sharp, once-for-all drop in nominal interest rates – to levels well below what Taylor's rule would imply. The effects of this fall are discussed in the next section.

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[21] Here defined as ending in the last quarter of 1997, reflecting the generally accepted observation that a change in regime emerged during 1998 with the approach of EMU. Note that by estimating the subperiods separately, we allow the intercept of the Taylor equation to differ, so that on average this allows the actual interest rate to have been "right" on average.

Table 3: *Fitting a Taylor model to Irish interest rate data quarterly 1980-2004*

Dependent variable is level of short-term nominal interest rate

	1		2		3	
	Coeff	*t*	Coeff	*t*	Coeff	*t*
Constant	3.62	3.6	0.165	0.5	0.99	0.6
4-qrtr inflation	0.169	3.1	-0.026	0.3	0.251	2.1
Output gap (OECD)	-0.040	0.4	0.027	0.8	0.166	3.6
Lagged interest rate	0.592	5.8	0.955	15.3	0.279	1.9
AR(1)					0.94	21.3
AR(2)						
Lag on infl / gap	0	0	0	0	0	0
Sample	80:2- 92:2		93:4- 04:4		93:4- 04:4	
RSQ/DW	0.792	1.74	0.872	1.46	0.916	1.85
β / γ	0.41	-0.10	-0.57	0.61	0.35	0.23

	4		5		6	
	Coeff	*T*	Coeff	*t*	Coeff	*t*
Constant	2.49	2.1	4.35	7.4	3.44	4.6
4-qrtr inflation	-0.018	0.1	0.362	1.9	0.638	2.8
Output gap (OECD)	0.066	1.0	0.110	2.1	0.181	3.4
Lagged interest rate	0.612	3.1	0.181	3.0	0.277	2.9
AR(1)			0.80	3.6	0.38	1.4
AR(2)			-0.60	3.3	-0.40	2.7
Lag on infl / gap	0	0	0	0	-1	0
Sample	93:4- 97:4		93:4- 97:4		93:4- 97:4	
RSQ/DW	0.446	1.25	0.790	2.02	0.806	2.36
β / γ	-0.05	0.17	0.44	0.14	0.88	0.25

	7		8		9		10	
	Coeff	*t*	Coeff	*t*	Coeff	*t*	Coeff	*t*
Constant	0.91	5.1	0.91	3.7	0.71	3.9	0.97	3.1
4-qrtr inflation	0.159	3.8	0.155	2.6	0.169	4.0	0.192	2.7
Output gap (OECD)	0.168	7.0	0.169	6.1	0.152	5.6	0.123	2.5
Lagged interest rate	0.385	6.7	0.387	3.3	0.440	8.4	0.360	3.6
AR(1)			0.03	0.1				
AR(2)			-0.02	0.2				
Lag on infl / gap	0	0	0	0	-1	0	0	1
Sample	98:4- 04:4		98:4- 04:4		98:4- 04:4		98:4- 04:4	
RSQ/DW	0.938	1.35	0.938	1.41	0.943	1.76	0.840	1.63
β / γ	0.26	0.27	0.25	0.28	0.30	0.27	0.30	0.19

Source: [see sheet Taylor-multi.xls]

3. A model of shock transmission embodying migration and construction

Having considered the role of shocks arising from exogenous interest rate and exchange rate movements, we turn now to looking at the market response of endogenous variables. Which of the main variables has been the most responsive, and have there been evident changes in the degree to which these responses occur?

In this section we use a simple model to provide an interpretation of the way in which the Irish economy has adapted to EMU-related shocks, with very slow adjustment of wage competitiveness, and overshooting in the property and construction market and in migration. The model is specifically constructed so as to capture these two specific issues relevant to the Irish economy's response to shocks post-EMU.[22] Migration needs to be covered because of the exceptionally open nature of Ireland's labour market, and property/construction because of the size of the interest rate shock and its impact on housing affordability.[23] The model shows how the amplitude of systemic response may change, depending on which of these channels are open.

The full model is set out in Appendix 2, together with some simulation plots. Briefly, there are seven equations, modeling wages, the price of goods and of housing, labour demand and migration, the stock of housing and expected price inflation. The wage rate evolves in response to expected inflation and towards an equilibrium relationship between the real wage and employment ratio. The price of goods is modeled as a variable mark-up on wage and import price costs, again with a lagged adjustment; the variation in the mark-up depends on expected inflation.[24] The modeling of relative house prices is based on affordability (wages relative to interest costs) and on the stock supply. Residential construction investment continues while there is a gap between house prices and the general price level. Employment and output are demand-determined, influenced by international competitiveness (influences external demand), and by house prices (reflecting both a wealth effect and also construction demand), again with a lag. Migration is captured by assuming that the labour force adjusts to close partially the gap between labour demand and supply.[25] Expected price inflation is very simply modeled as a lagged partial adjustment to actual inflation.

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[22] Duffy, FitzGerald and Kearmey (2005) also model the interaction between migration and construction in Ireland; though their goal is to examine longer-term equilibrium, and they use consistent annual data to estimate the equations. Despite significant differences of detail, there is a family resemblance between the two modeling approaches. Our model is focused on short-term dynamic adjustment and in this respect draws on the work of Deroose et al. (2004) whose model is designed for analysis of shocks in the EMU, but who do not model migration or the property market. (Another example of this type of work, with application to Spain, is in Lopez-Salido et al., 2005).

[23] The interest rate impact in Ireland on sectors other than property are likely, for a variety of reasons, to have been much smaller.

[24] This modeling draws on Gali and Gertler (1999), though the dominant role of external prices in Irish inflation has often been shown; no qualitative difference in the simulation results would follow from suppressing the variability of the mark-up.

[25] A further refinement would be to differentiate between the migration response of high- and low-skilled workers as in Bergin and Kearney (2004) who assume that only the former migrate and only the latter suffer unemployment, cf. FitzGerald and Kearney (2000) and Duffy et al. (2005) . The ESRI modelers also have migration depending on relative wages rather than excess labour market demand.

As a result of the interaction of lagged adjustments in different markets, models of this type typically predict an adjustment path of prices and quantities that may cycle around the equilibrium, initially overshooting it.[26] Our model is no exception in this respect. Interestingly, for the parameters with which we have simulated the model, the impact of a change in interest rates is most conspicuous at first in house prices, followed by wages, and lastly by consumer prices. The low amplitude of the movement in consumer prices reflects the model's assumption that import prices anchor a large component of consumer prices and that substitution in the product market between imports and local production is high. The initial surge in house prices promotes construction demand and this encourages in-migration, which in turn adds to the demand pressures, though allowing wages to fall back. The potentially protracted nature of this adjustment is evident from the simulations and from the inevitable lags that will be involved in each of the elements. Relative house prices remain high for a long-time, even though we have modeled the negative feedback from the accumulating housing stock on housing prices.[27]

If there were no property market and no migration, the pattern of effect would be quite different. Absent the property market, employment and wages would not rise by so much and the effects would be shorter in duration. Migration has the effect of dampening the wage response, but it increases the duration of the output and employment effect,. The simulations reported in Appendix 2 confirm this intuition.

While parametric, the average nominal exchange rate for Ireland against its trading partners is not fixed in the new regime, and this induces shocks to prices and competitiveness that need to be factored-in. In our model, this comes through the import price variable. The consequences for the economy of a rise in import prices is clear enough: competitiveness rises, resulting in an increase in wages and net immigration, as well as higher house prices and construction activity, and higher output generally.

Combining the two impacts, interest rate and exchange rate, results in some reinforcement and some offsetting, especially with a see-sawing pattern of exchange rate changes along the lines experienced so far in EMU, as illustrated in Appendix Figure 3.[28]
The theoretical model thus reveals how, with slow and imperfect macroeconomic adjustment, the initial interest rate shock had the potential to create a sustained construction-led boom with a positive feedback through migration, even despite exchange rate induced losses of competitiveness. In the remaining sections, we the empirical data on the evolution of these key variables, showing how actual movements do seem to correspond broadly to model predictions, and highlighting in particular the slowness of wage adjustment to losses of international competitiveness.

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[26] The literature on how some markets will over-react if others are constrained from clearing has a long pedigree going back at least to Samuelson. In the open economy macro literature, Dornbusch's (1976) overshooting model has been adapted to many different contexts, and is microfoundations strengthened (cf Hau, 1996, 2000; Lane, 2001, Obstfeld and Rogoff, 1996).

[27] Note that we have not built in forward-looking expectations in the model, and as such are not assuming any bubble-like behaviour.

[28] A third exogenous variable has been included in the model, but not discussed here, namely fiscal policy as an additive factor in labour demand.

4. Endogenous responses in practice

The model of the previous section is, of course, too schematic to capture much of the detail of Ireland's empirical experience. Yet when we look at the empirical counterparts of the model's main variables we find important confirming evidence of the mechanisms described. In particular, we note (following the very large initial fall in interest rates, concentrated in 1998) a dramatic increase in the relative price of property, a sharp upturn in construction activity, unprecedented immigration, and *comparatively* little evidence of adjustment in wages. In Section 4.1 we briefly document the first two of these developments, turning to migration in Section 4.2 and in more detail in Section 4.3 to the evolution of international wage competitiveness both before and since the start of EMU.

4.2 Housing:

The surge in residential property prices has been widely discussed (and subjected to econometric analysis, e.g. Roche (2003). In a period of widespread property booms worldwide, Ireland's experience still stands out as, on at least some measures, the strongest boom. Figure 6 shows a long time series of residential property prices deflated by the consumer price index; even with this deflation, the exceptional nature of recent house price movements can be clearly seen. A major driving factor has been the fall in nominal and real interest rates, which can be seen either as inverse capitalization factors, or inverse measures of affordability. The fall in nominal interest rates was most pronounced in 1998, the year of most rapid house price increase.

In addition to the price increase, there has been a surge in construction activity, just as predicted by the model. Figure 7 shows the sharp rise the share of overall employment absorbed by the sector. Indeed, the increased reliance of the economy on the construction sector has become one of the most distinctive aspects of the economic expansion as it has matured since the effects of EMU began to have an impact.

An important aspect of euro membership for the construction sector is that, in contrast to the narrow-band ERM period when the authorities routinely increased rates to defend an overvalued exchange rate peg, real interest rates are no longer positively correlated with the real exchange rate. As a consequence, the construction sector is more insulated than before from external competitiveness shocks.

Given the increased importance of the construction sector in the economy, and the relationship of that to property price movements, it is important to note that, whereas exchange rate and inflation expectations have been stabilized by EMU, the potential of destabilizing expectations about the relative price of housing/property markets still remains, and indeed this sector may increasingly have become the focus of such destabilizing expectations. There is no general agreement as to whether these property price movements also embody a bubble in addition to the increase in equilibrium prices warranted by the fall in interest rates, and this paper will not offer any new opinion on that matter.

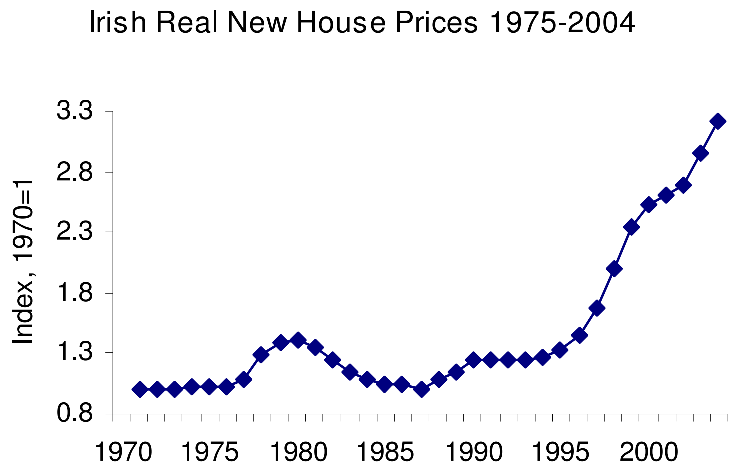


Figure 6: *New house prices as a multiple of CPI* (Index, 1970=1).
Source: DOE (house prices and credit 05.xls)

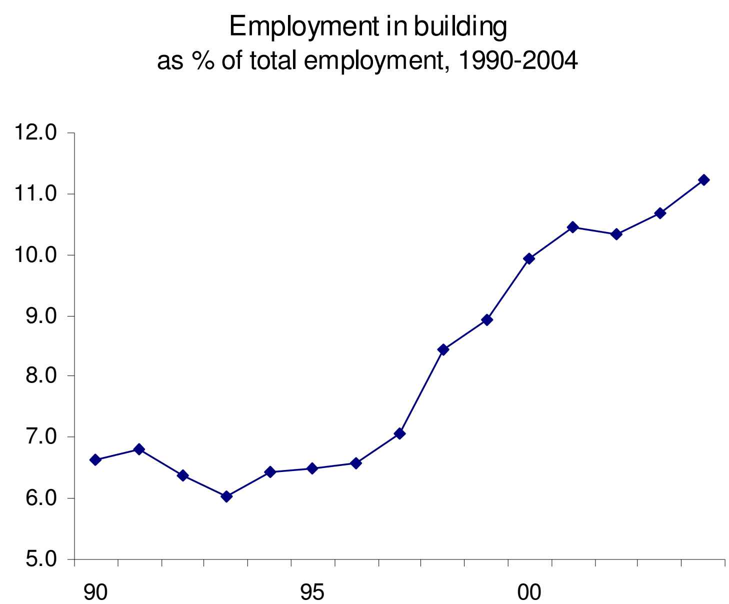


Figure 7: *Employment in building as % of total employment, 1990-2004*.
Source: ESRI database (production aggregates nie 03.xls)

4.2 Migration

It is likely that the relatively modest response of real wages (discussed in 4.3 below) to the initial favorable shocks reflects the sizable migration flows that have occurred.[29] Inward migration in each of the years 2000-2004 was between ½ and 1 per cent of population, and exceeded that for any other year on record (Figure 8). And these have also been the years in which the Irish unemployment rate has fallen below that of the UK for the first time (Figure 9). The surge in migration is very striking: it appears that the labour market has adjusted through quantity movements and not only through prices. But it is not evident from the data that this reflects an autonomous surge in migration behaviour. To be sure there are novel elements in recent migration flows, but the point here is that much of the additional inflows can be explained purely in terms of an endogenous adjustment of the labour market. For instance, Figure 10 plots net immigration against the Ireland-UK unemployment differential and shows that recent observations (the six at the upper left) are close to the a regression line drawn for data from the previous four decades.[30]

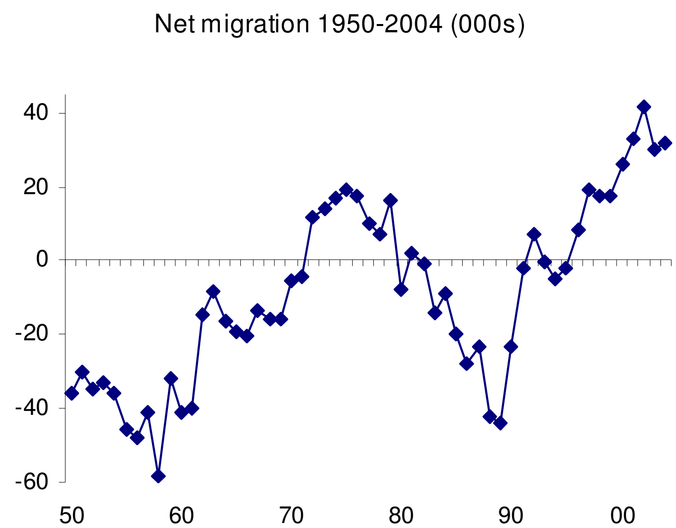


Figure 8: Net migration in thousands, 1950-2004.
Source: ESRI Database; CSO. (labforce survey.xls)

[29] Reflecting the openness of the Irish labour market, some relationships observed in other countries have not been present in the Irish data, whether before or since the start of EMU. Specifically, Irish unemployment does not appear to be closely and reliably related to wage inflation over the period (Phillips' Curve, cf. Curtis and FitzGerald, 1996; Walsh, 2000). Nor does Irish unemployment correlate well on a short-term (e.g. quarterly) basis with GNP growth (Okun's law), though Walsh (2004) has pointed out that, over a long annual time series period (1961-2000), a significant correlation is obtained.

[30] Honohan and Walsh (2002) provide further regression evidence that a dynamic link between UK and Irish unemployment, mediated by migration, continued into the boom period.

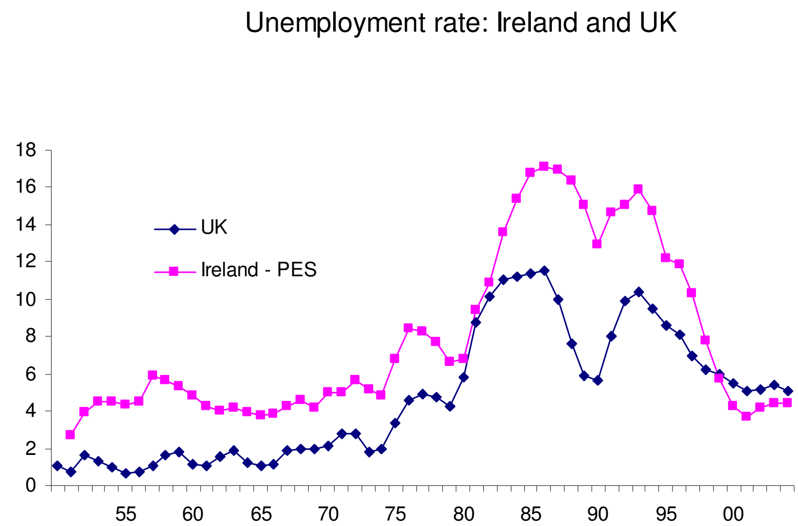


Figure 9: Unemployment rates in Ireland and the UK, 1950-2004.
Source: ESRI Database (loops05.xls)

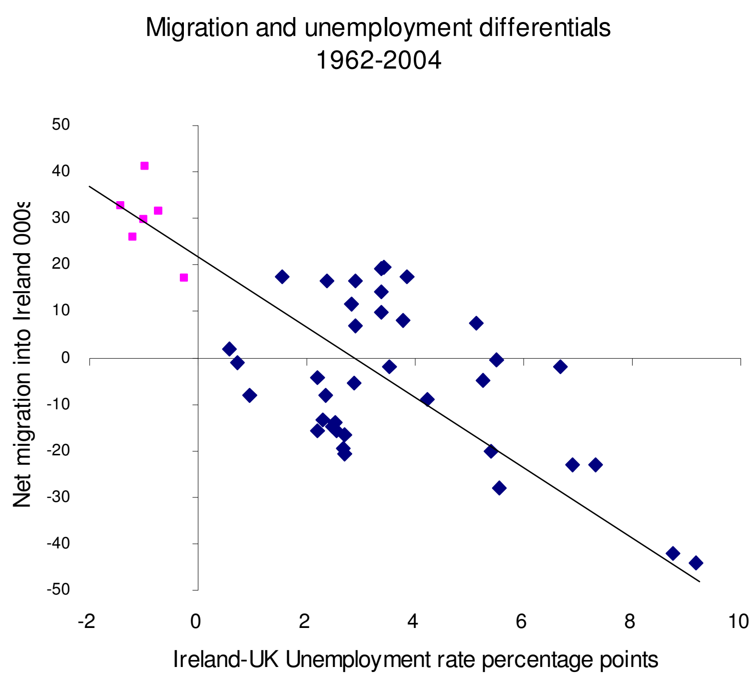


Figure 10: *Migration and unemployment differentials.*
Source: ESRI Database (loops05.xls) EMU observations in red colour

4.3 Wage competitiveness

Wage competitiveness is clearly the key relative price for macroeconomic purposes. In this subsection we examine whether wage competitiveness is a stable, self-correcting process. Three distinct elements contribute to short-run fluctuations in wage competitiveness: Irish wage rates, foreign wage rates and exchange rates.[31] The dynamics of each is distinct. Foreign wage rate movements can be regarded as exogenous to the Irish economy. Exchange rates are now also exogenous (as discussed above), but before EMU, the DM peg was adjusted from time-to-time in a way which did respond to Irish macroeconomic conditions (Honohan, 1993). Now it is only the nominal wages that can adjust and the speed of adjustment of wage competitiveness to shocks therefore indirectly measures the speed of nominal wage adjustment to loss of wage competitiveness. Irish wages are themselves subject to a series of bargaining procedures, at centralized national and decentralized levels. The evolution of Irish nominal wage rates is best seen as a two-stage process (Walsh, 2004). For the past two decades, national centralized wage agreements (negotiated in a tripartite package that also includes tax, public spending and other issues) have established a multi-year *base-line*[32] for the evolution of wages generally. Coverage of these agreements has been high, and indeed they have also been taken as a benchmark for many non-covered employments. The base line has specified phased increases (usually two or three over a two or three year period) in wage rates. In addition, special productivity-related or other increases have been negotiated at plant level, resulting in *wage drift* relative to the base-line.

Evidently, the bargaining will take account of many issues, including recent and prospective consumer price inflation. (Since the start of EMU period inflation has tended to erode much of the increase in nominal earnings; real earnings have increased by an average of 2.4 per cent per annum over the EMU period.) It will also be influenced by demand conditions and by changes in international competitiveness.

Both the base-line negotiations and the drift can respond to emerging disequilibria, though the drift will do so more quickly, as the base-line has never included a competitiveness adjustment clause, despite suggestions that it should. The wage agreements directly affect the competitiveness of labour to the extent that they do determine wage rates, and hence the ability and incentive of private firms to maintain or expand employment. Furthermore, to the extent that public sector wages are passed through to costs, one way or another, they too will affect the competitiveness of private sector firms.

Before EMU there was no systematic tendency for higher nominal public sector wages to be associated with reduced price competitiveness as measured by relative CPI levels. However, intriguingly, the continued rise in nominal public sector wages since EMU began has occurred at a time when the Irish CPI has raced ahead of competitors, when measured in a common currency, as can be seen from the upper part of Figure 11 and Figure 12. Figure 11 plots nominal public sector wages as negotiated against a trade-weighted index of relative (exchange-rate adjusted) consumer prices. The upper part of the Figure relates to the EMU period. In this period, increases in nominal public sector wages have been associated with a faster increase in Irish consumer prices relative to those abroad, in contrast to the pattern which prevailed in the previous decade.

[31] Of course productivity and quality issues are also crucial, but we leave those in the background for this discussion. For one thing, in Ireland, aggregate measured average labour productivity in manufacturing moves sharply depending on changes in the relative output of low wage-share sectors such as pharmaceuticals, IT equipment and software-related manufactures, without these shifts necessarily reflecting any change in marginal labour productivity.

[32] Employers can and have pleaded inability to pay this base-line.

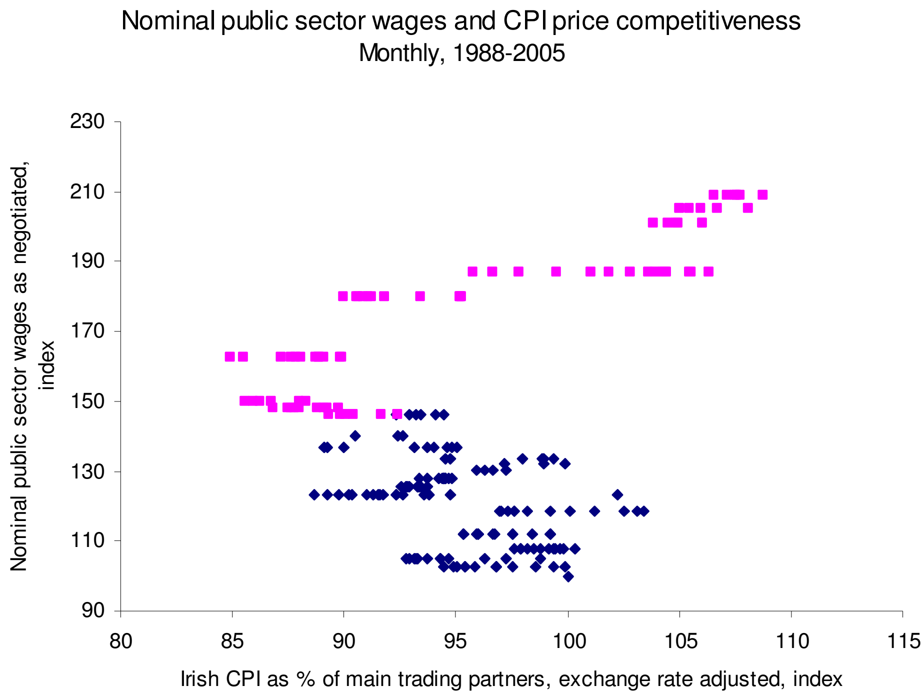


Figure 11: *Nominal public sector wages and CPI price competitiveness*, monthly, 1988-2005
Note that time increases from lower to higher values of the wage index. (EMU observations in colour.)
Source: Nat wage agreements.xls

However, with Ireland being a price-taker on many international goods markets, relative CPI levels cannot be expected to provide a very reliable indicator of international competitiveness. Instead, we need to focus directly on measures of wage competitiveness. It is well understood that comparisons based on unit labour costs are inappropriate in any data including aggregate manufacturing in Ireland because of the distortions related to low wage share (transfer pricing) sectors (Honohan and Walsh, 2002). Therefore, hourly or weekly wage costs are considered the most appropriate basis for tracking short-term changes in the average competitiveness of Irish workers. Even so, the annual series published by the Department of Finance and by the Central Bank of Ireland diverge inexplicably at some points (especially at 1985-6 and again in 1996-7) and, since the trade weights for both have never been published, it has not been possible to pin down the reason for the discrepancy.

Figure 12 shows the evolution of the wage competitiveness indexes from the two sources. Regardless of the differences, it is clear from both series that an upward trend (loss of competitiveness) over the previous ten years was interrupted in the mid-1980s for at least a decade. This must have contributed strongly to the employment surge of the Celtic Tiger period. (Honohan-Walsh, 2002). Since 2000, however, competitiveness has been lost rather severely

Ideally we could try to estimate how quickly the base-line, drift and exchange rate elements of the wage competitiveness process adjust to indicators of emerging disequilibria (unemployment, and perhaps profitability of industry, fiscal pressures, and simply deviations of wage competitiveness). An multi-element error-correction model could be the ideal approach, possibly incorporating probabilistic elements to reflect the fact that exchange rate peg adjustment is only at time of realignments and that the timing of base-wage increases is determined by the multi-year agreements.[33]

Unfortunately, official data on aggregate Irish wage competitiveness (measured against trading partners) have, over the years, been remarkably thin and problematic, partly due to the weakness of high-frequency aggregate wage rate data .[34]

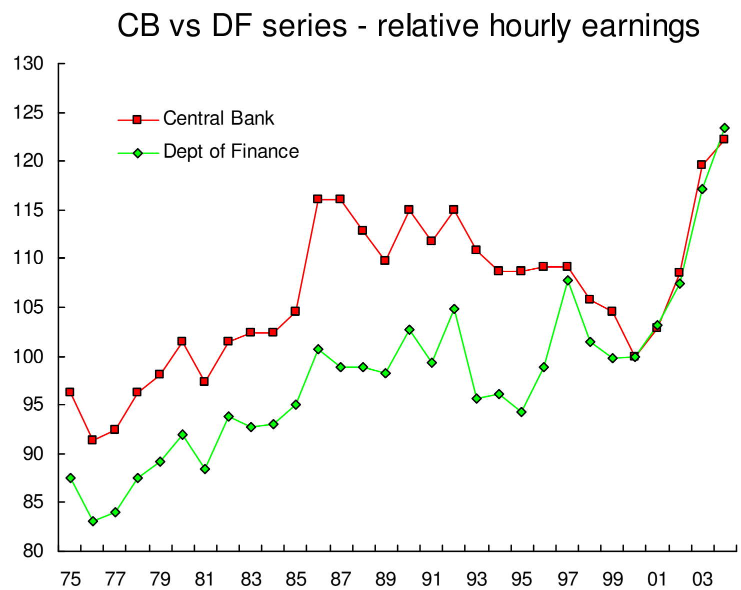


Figure 12: *Aggregate index of wage competitiveness vs. main trading partners: two sources*
(Both series rebased to 2000=100. The Department of Finance series ends in 2001, but is continued by using the Department's figures for UK, US and Germany, weighted 0.19, 0.25 and 0.56 respectively). Source: Compet.xls

Quarterly or monthly data are really needed if we are to get a good measure of the speed of adjustment of wage competitiveness, but in the absence of economy-wide sub-annual indices we content ourselves with presenting some simple autoregressive equations estimated on annual data (using the Central Bank series) (Table 4).[35] (Thus we estimate: $\Delta w = \alpha_0 + \alpha_1 T + \alpha_2 T^2 - \lambda w_{-1}$) where w is the competitiveness index, and T is a linear time trend.)

[33] Although on aggregate data the latter effect may be smeared over adjacent months because, while the negotiation is common, not all groups have the same actual dates of effectiveness of wage increases.
[34] Even for changes; the question of levels is even more difficult, see FitzGerald (2005), who stresses the importance of disaggregating wage changes in Ireland in the past decade as between low-skill and high-skill.
[35] The sample is in particular too short for interesting results from unit root tests. For what its worth standard tests are all insignificant leaving us unable to reject existence of a unit root

Table 4: *Autoregressive character of competitiveness index, 1978-2004*

Dependent variable is change in competitiveness index; Annual CB data

	1		2		3		4		5		6	
	Coeff	*T*	Coeff	*T*	Coeff	*t*	Coeff	*t*	Coeff	*t*	Coeff	*T*
Constant	25.8	2.3	31.4	2.0	54.2	3.0	-1.79	0.0	-26.0	0.9	1504	2.0
Lagged compet.	-0.245	2.2	-0.314	1.8	-0.689	2.9	0.035	0.1	-0.296	1.0	-1.60	2.3
Time			0.105	0.5	2.42	2.2			2.15	2.7	-103	1.9
Time^2					-0.073	2.1					1.98	2.0
Sample	1978-1997		1978-1997		1978-1997		1998-2004		1998-2004		1998-2004	
RSQ/DW	0.221	2.12	0.226	2.09	0.399	1.88	0.002	1.05	0.652	2.12	0.849	2.53

For the ERM period, whether or not we include a linear or quadratic time trend, the adjustment coefficient (on lagged competitiveness) is significant at least at the 10 per cent level. For the EMU period – only seven observations – we need to add what turns out to be a very steep quadratic time trend to get a significant adjustment coefficient.

If instead we impose the time trend to be common through the whole period, and estimate:
$\Delta w = \lambda(1-\theta D)(\alpha_0 + \alpha_1 T + \alpha_2 T^2 - w_{-1})$,
where D is an EMU dummy, we obtain $\lambda = 0.648$ ($t = 2.9$); $\theta = 1.32$ ($t = 6.5$), with an R-squared of 0.365 and a Durbin-Watson statistic of 1.88, for the maximal sample period 1976-2004. This estimate suggests that the adjustment process was effective before 1978, but not since, as the coefficient θ greater than unity (and significantly greater than -0.9) implies that at least 90 per cent of the adjustment parameter is eroded in the EMU period.

The indications, then, both from visual inspection of the runaway trend, and from simple regression models, is of an adjustment process for wage competitiveness which has lost all traction in these early years of EMU. Absent continued lucky breaks in other dimensions, this is something which will have to change if unpleasant costs are not to be incurred.

5. Concluding remarks

We began with two questions: are exogenous shocks hitting the Irish economy larger in EMU and how have the economy's endogenous responses to shocks changed as a result of the regime change?

Our conclusion on shocks is that these have not on balance increased by much. There may have been a slight increase in exchange rate volatility. At first sight, short-run effective exchange rate index volatility seems, if anything, to fall during EMU, but closer inspection shows that this is because of the contribution of corrective realignments in the earlier period. Furthermore, the amplitude of the low-frequency oscillation during the EMU period is higher than was normal before.

The interest rate story also suggests little systematic increase in the level of shocks. Interest rates have not been appropriate to local conditions during EMU, but that was also true for different reasons in the previous exchange rate regimes. We have assessed shocks here by comparing actual interest rates to those which would be generated by a Taylor rule for Ireland. By this standard, interest rates were much too high on average in the ERM period, reflecting agency costs (e.g. the market's fear of an inflationary strategy to solve problem of high government debt, and its fear that the authorities would pursue an overly devaluationist response to sterling weakness). In the EMU period, by contrast, interest rates in Ireland have on average been much too low by the Taylor criterion.

Turning from the average level of interest rates to their responsiveness to output gaps and inflation, the ERM period also showed a lack of monetary policy response. Curiously, although interest rates in EMU are not set in response to Irish conditions, the data fits a pseudo-Taylor rule with significant responses to inflation and output gaps. This relationship is presumably induced by the correlation of Irish conditions in the sample period with the EMU-wide factors driving ECB policy. To what extent this correlation is fortuitous, and to what extent structural, is not known. Anyway, the size of the response of the pseudo-Taylor rule to inflation is too small (about 0.3) to be sufficiently stabilizing in itself.

As to the adjustment of the remainder of the economy, we have stressed the substantial role of the housing market both in prices and in activity. In particular, the initial fall in real interest rates had its most dramatic effect on the property market and especially in residential property prices. As predicted in our simple model, this price effect was transmitted to activity, with the result that the strong aggregate output performance (which has both encouraged and been fed by migration flows) has been increasingly construction-led largely explaining the resilience of economic activity into 2005.

Adjustment mechanisms in the labour market seem to have been weak. There is evidence that international wage competitiveness was maintained through an adjustment process around a time trend in the ERM period. But since EMU began, there is no sign of the adjustment mechanism persisting. Indeed, the lack of responsiveness of competitiveness indicators to weakening employment conditions is striking. Instead of wage-price responses, migration flows have continued to represent the major form of labour market adjustment.

The loss of wage competitiveness since the start of EMU has been quite sharp. Against the US, the loss has averaged 3.3 per cent per annum – with earlier gains partly offsetting a more dramatic fall since 2002; against Germany, the loss has averaged 2.1 per cent per annum. The sustainability of such losses must be doubted.

Despite the loss of competitiveness, exports have continued to surge, growing by 11.9 per cent in 2004 despite the falling competitiveness. However, these data undoubtedly contain a certain amount of momentum reflecting earlier capital formation. Calculations in European Commission (2005) showing that Ireland lost export market share in each sector in recent years, but benefited from its concentration in sectors whose world market was growing, are particularly worrying in this context.

* * *

While neither interest rate nor exchange rate movements have been helpful for internal macroeconomic stability in Ireland since EMU began, this dimension seems on balance no worse than it was before EMU began. To have an independent monetary and exchange rate policy does not mean that it will be used in an optimal manner. Ireland's practical experience in this regard suggests little loss from the abandonment of an autonomous currency.

On the other hand, the initial fall in interest rates has unleashed a long-lived property price and construction-led boom which, interacting with long-standing migration forces in manner modeled by our algebraic model, has allowed the economy in aggregate to survive – for the present – a relatively severe loss of labour competitiveness. This may help explain why losses of wage competitiveness have not yet been followed by a downturn in employment as has been feared for several years now (cf. Bergin et al. 2003; Leddin, 2001). As this positive force finally weakens, the absence of effective wage adjustment mechanisms suggests that the prospect of a lengthy period of labour market weakness cannot be ruled out.

Appendix 1: Fitting the Taylor Series to a Cross-country Panel

Comparison with other small countries reveals some parallels and some differences with the Irish experience with nominal interest rates by comparison with the Taylor Rule, as presented in Section 2.2. Many of the twelve other small industrial countries for which data is shown in Figure A1 also began the 1980s with interest rates that were too low, relative to the Taylor rule. No wonder, then that – Austria, Switzerland, Belgium and the Netherlands apart, all had double digit inflation rates into the 1980s. The general increase in interest rates to levels at or above the Taylor rule coincided (not surprisingly) with elimination of double-digit inflation in all of the other countries. Denmark last saw a year of inflation above 8 per cent in 1982, Finland in 1983 and Ireland in 1984; Norway and New Zealand followed in 1987, whereas Iceland, Sweden and Poland had to wait until 1990-2, and Greece until 1996.

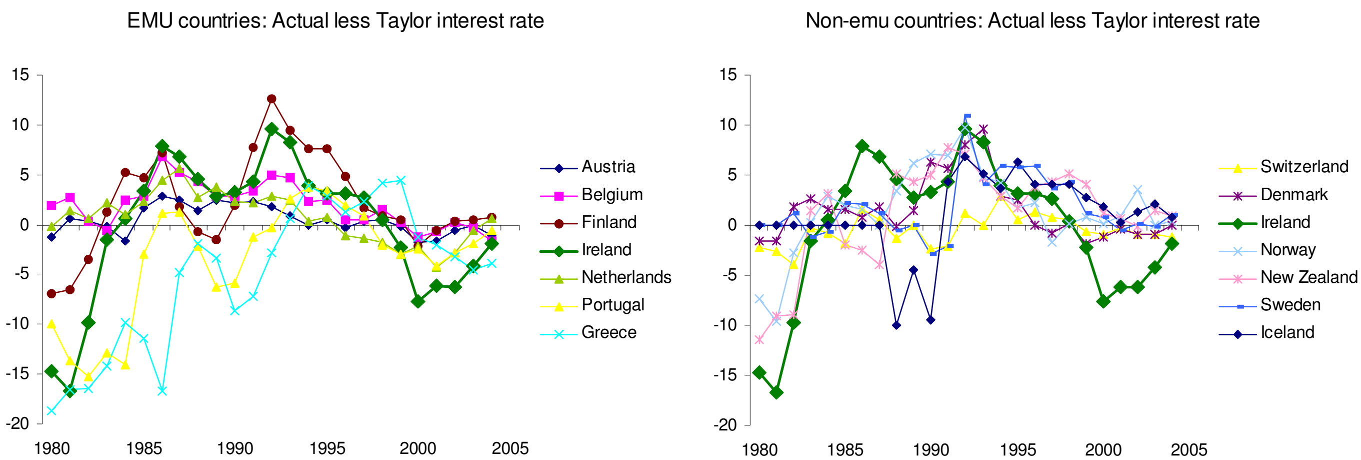


Figure A1: *Excess of actual over Taylor rule interest rates: Small countries 1980-2004*
Source: OECD Economic Outlook 77 (small emu int edited.xls)

Yet Ireland has the distinction of a higher variance in the gap between Taylor rule and actual interest rate than any of these countries, other than Greece. Furthermore, Irish interest rates have averaged further below the Taylor rule value than in any other of these countries since the EMU began (Table A1).

Table A1: *Selected small economies: Excess of actual interest rate over Taylor rule.*

Averages & variation 1979-2004, Annual data

	1979-2004 mean	*stdev*	1979-82 mean	1983-97 mean	1998-2004 mean	*Stdev*
Austria	0.3	*1.4*	-0.6	1.1	-0.7	*0.8*
Belgium	2.0	*2.2*	2.1	3.0	-0.3	*1.1*
Switzerland	-0.7	*1.7*	-3.2	0.0	-0.6	*0.6*
Denmark	n.a.	*n.a.*	n.a.	2.9	-0.7	*0.7*
Finland	1.9	*4.8*	-5.2	4.7	0.0	*1.0*
Greece	-5.5	*7.3*	-16.9	-4.7	-0.9	*3.7*
Ireland	**-0.6**	***7.0***	**-12.7**	**4.2**	**-4.0**	***2.9***
Iceland	n.a.	*n.a.*	n.a.	n.a.	1.9	*1.3*
Netherlands	0.8	*2.4*	0.9	2.0	-2.0	*1.6*
Norway	1.5	*4.1*	-4.9	3.4	0.8	*1.3*
New Zealand	n.a.	*n.a.*	n.a.	2.9	1.9	*2.0*
Portugal	-4.1	*6.4*	-14.8	-2.1	-2.4	*1.1*
Sweden	n.a.	*n.a.*	n.a.	2.3	1.0	*1.6*
Median	0.3	*4.1*	-4.9	2.6	-0.6	*1.3*

Quarterly data

	1980q1-2004q4 Mean	*stdev*	1980q1-1982q4 mean	1983q1-1997q4 mean	1998q1-2004q4 mean	*Stdev*
Finland	2.1	*4.9*	-6.1	4.7	-0.1	*1.2*
Iceland	n.a.	*n.a.*	n.a.	n.a.	3.2	*2.7*
Ireland	**0.0**	***7.0***	**-12.5**	**4.3**	**-4.0**	***2.9***
Netherlands	0.5	*2.5*	0.1	1.8	-2.2	*1.7*
New Zealand	n.a.	*n.a.*	n.a.	n.a.	1.6	*1.9*
Norway	1.4	*4.8*	-7.7	3.4	1.0	*1.7*
Sweden	1.5	*5.1*	-3.6	2.7	1.1	*1.7*
Median	1.1	*4.9*	-5.1	3.1	0.6	*1.7*

Source: OECD Economic Outlook 77; Quarterly inflation and interest rates: IFS (small emu int edited.xls).

Quarterly data on output gap, allowing calculation of the Taylor rule interest rate, is available from the OECD Economic Outlook Database for seven countries: Finland, Iceland, Ireland, Netherlands, New Zealand, Norway, Sweden. Estimating a constant coefficient Taylor rule with this data (along the lines of Table 3 in the text) for the whole period for the non-EMU countries suggests a significant coefficient on inflation with the point estimate β greater than unity for the whole period.[36] Iceland is a significant outlier, and more precise estimates are obtained when it is dropped from the regression. A greater than unity coefficient is also obtained for the non-EMU countries when estimation is over the pre-EMU period 1993Q4-1997Q4. However, in the post EMU period 1998 Q4-2004 Q4 inflation is no longer significant in the equation. This may reflect the low variance of inflation in the recent period.

[36] The estimation strategy waqs to include forst or second order autocorrelation processes to the extent required to eliminate seriol correlation in the residuals. Up to two quarter leadas and lags of the inflation variable were used as alternatives. The one quarter lead often gave the best fit. A representative selection of resucts is reported here.

Adding the three EMU countries, and estimating over the earlier period, inflation remains significant with calculated β coefficient in excess of unity for most specifications – as such the panel provides a different story to that of the Ireland data alone.

Table A2: *Fitting a Taylor model to interest rate data for other small countries*
Dependent variable is level of short-term nominal interest rate

For 3 non-EMU countries Norway, Sweden, New Zealand

	1		2		3		4		5	
	Coeff	*t*	Coeff	*T*	Coeff	*T*	Coeff	*t*	Coeff	*t*
Constant	0.165	0.9	0.35	1.3	0.21	0.99	0.187	0.8	*	
4-qrtr inflation	0.143	2.6	0.131	2.0	0.199	3.2	0.192	3.1	0.163	2.5
Output gap (OECD)	0.071	2.6	0.057	1.7	0.041	1.3	0.054	1.6	0.116	2.3
Lagged interest rate	0.916	27.1	0.886	18.8	0.888	20.8	0.895	21.2	0.856	15.2
AR(1)			0.51	5.5	0.44	4.7	0.449	4.8	*	
AR(2)			-0.23	2.6	-0.20	2.3	-0.217	2.5	*	
Lag on infl / gap	0	0	0	0	-1	0	-1	-1	-1	-1
Sample	93:4-04:4		93:4-04:4		93:4-04:4		93:4-04:4		93:4-04:4	
RSQ/DW	0.888	1.22	0.912	2.05	0.913	2.03	0.913	2.03	0.918	2.02
β / γ	1.69	0.84	1.15	0.50	1.78	0.37	1.83	0.51	1.13	0.80

For 3 non-EMU countries Norway, Sweden, New Zealand

	6		7		8		9		10	
	Coeff	*t*	Coeff	*T*	Coeff	*T*	Coeff	*t*	Coeff	*t*
Constant	0.081	0.2	-0.340	1.0	0.413	2.1	0.619	1.6	0.326	1.4
4-qrtr inflation	0.254	2.9	0.360	4.5	0.162	2.7	0.091	1.3	0.046	0.8
Output gap (OECD)	0.039	1.1	0.017	0.5	0.214	4.3	0.136	1.9	0.176	3.6
Lagged interest rate	0.905	17.9	0.937	21.4	0.820	18.4	0.810	10.3	0.885	17.9
AR(1)							0.48	3.8	0.64	7.5
AR(2)									-0.38	4.9
Lag on infl / gap	0	0	-1	0	-1	0	-1	0	-1	-1
Sample	93:4-97:4		93:4-97:4		98:4-04:4		98:4-04:4		98:4-04:4	
RSQ/DW	0.897	1.56	0.913	2.03	0.921	1.36	0.938	1.97	0.957	2.07
β / γ	2.69	0.41	5.68	0.27	0.90	1.18	0.48	0.71	0.40	1.53

For all non-EMU countries Iceland, Norway, Sweden, New Zealand

	1		2		3		4		5	
	Coeff	*t*	Coeff	*T*	Coeff	*T*	Coeff	*t*	Coeff	*t*
Constant	0.902	3.5	0.074	0.2	0.547	0.9	0.790	2.2	0.471	1.5
4-qrtr inflation	0.334	3.9	0.282	3.4	0.254	2.3	0.526	4.0	0.428	3.7
Output gap (OECD)	0.077	1.8	0.024	0.8	0.023	0.5	0.186	1.9	0.217	2.7
Lagged interest rate	0.743	15.0	0.902	19.4	0.842	10.6	0.653	8.8	0.742	10.7
AR(1)					0.35	2.5			-0.254	2.3
AR(2)										
Lag on infl / gap	-1	0	-1	0	-1	0	-1	0	-1	0
Sample	93:4-04:4		93:4-98:4		93:4-98:4		98:4-04:4		98:4-04:4	
RSQ/DW	0.760	2.11	0.868	1.46	0.883	2.07	0.770	2.45	0.781	2.18
β / γ	1.30	0.30	2.88	0.24	1.61	0.14	1.51	0.53	1.66	0.84

For all seven countries pre-EMU period (: Finland, Iceland, Ireland, Netherlands, New Zrealand, Norway, Sweden)

	6		7		8		9			
	Coeff	*t*	Coeff	*T*	Coeff	*T*	Coeff	*t*	Coeff	*t*
Constant	-0.118	0.5	0.606	1.5	0.196	0.6	*			
4-qrtr inflation	0.225	3.5	0.101	1.3	0.207	2.6	0.241	3.0		
Output gap (OECD)	0.011	0.7	0.030	1.0	0.014	0.6	0.023	0.6		
Lagged interest rate	0.937	31.1	0.864	13.8	0.894	18.7	0.780	10.5		
AR(1)			0.43	3.9	0.35	3.6	0.33	2.8		
AR(2)										
Lag on infl / gap	-1	0	0	0	-1	0	-1	0		
Sample	93:4- 97:4		93:4- 97:4		93:4- 97:4		93:4- 97:4			
RSQ/DW	0.900	1.4	0.909	2.01	0.912	2.06	0.922	2.06		
β / γ	3.56	0.19	0.74	0.22	1.96	0.13	1.10	0.10		

* denotes country fixed effects were included

Appendix 2: A simple dynamic model

A simple algebraic model of price and wage dynamics, such as has recently been used to simulate the differential impact of shocks on different euro-zone economies (cf. Deroose et al. 2004), can be adapted[37] to show the role of the construction industry and migration in an economy such as that of Ireland where these have proved important in the EMU years. Recently, Duffy et al (2005) have also modeled the interaction between migration and house prices for Ireland, and there are significant similarities in the modeling, albeit their approach has a longer-term perspective in constrast to the current exercise designed to illustrate short-term fluctuations and interaction between the sectors.

Four prices are important: w, the nominal wage rate; p, the price of goods; p^h, the price of housing; $p*$, the exogenous[38] price of foreign goods. The level of employment l and the labour force n , and the housing stock h are stock variables, the latter two to be taken as slowly-evolving state variables as we will see. All these variables expressed in logs. The inflation rate is written $\pi_{t+1} = p_{t+1} - p_t$ and superscript e denotes the expectation (at the previous period – i.e. p^e_{t+1} is the expectation at time t of the price at time t+1); the nominal interest rate (not logs) is r.

The nominal wage rate evolves in response to expected inflation movements towards an equilibrium relationship between the real wage and employment ratio:

$$(1) \quad w_t = w_{t-1} + \alpha_1(p_t^e - p_{t-1}) + \alpha_2[\alpha_3(l_{t-1} - n_{t-1}) - (w_{t-1} - p_{t-1})]$$

The price of goods is modeled as a variable mark-up on costs: the costs are modeled as a fix-weight average of wages and import prices; the mark-up increases with higher expected inflation (Gali-Gertler, 1999). Even though the Gali-Gertler story already embodies staggered price-setting, we follow Deroose et al in allowing gradual adjustment to the modeled mark-up.[39]

$$(2) \quad p_t = \nu p_{t-1} + (1-\nu)[\lambda_1 w_t + (1-\lambda_1)p_t^m + \lambda_2(p_t^e - p_{t-1})]$$

As a long-lived asset, the fundamental price of housing is often modeled as being determined by the discounted present value of future rentals and terminal resale value. The future resale price is hard for the market participant and for the modeler to determine with any precision, and the degree to which a bubble might also be present in the actual price is widely studied (for the Irish context, see Roche, 2003). Furthermore, myopia, liquidity constraints and transactions costs can make short-term considerations of affordability and user demand equally, or more relevant to

[37] The main differences with Deroose et al. are as follows: (i) whereas they treat interest rate movements as having a generalized demand effect, we model the construction sector separately thereby allowing a distinct interest rate effect, and revealing housing price dynamics; (ii) we allow the labour force to evolve in response to real wage differentials; (iii) we include a housing wealth term in lieu of net foreign assets (as we regard the latter as too slow-moving to have interesting short-term dynamics; (iv) we do not include the quadratic inflation term in the price equation.

[38] The local price of foreign goods is exogenous (the product of exogenous foreign prices and the exogenous movement of the nominal effective exchange rate.

[39] Here and elsewhere, the reader will notice that rational expectations have not been assumed. Many alternative price adjustment models are possible: this one has the merit of making the model tractable.

short-term price determination, as well as being easier to model. The major elements of the affordability calculation are aggregate wage income and the real interest rate (during high inflation, nominal interest rate may be separately relevant). The market-clearing price of housing will be higher, the higher the affordability and the lower the stock of housing; this is the basis of the equation (3) (cf. Duffy et al.2005). In the present exercise, we do not attempt to include a term capturing expectations of resale value.

(3) $p_t^h = p_t + \beta_1(w_t - p_t + l_t) - \beta_2[r_t - (p_t^e - p_t)] - \beta_3 h_{t-1}$

Residential construction investment continues while there is a gap between house prices and the general price level.[40]

(4) $h_t = h_{t-1} + \xi(p_{t-1}^h - p_{t-1})$

Ignoring issues of factor substitution, we will simply assume that employment is proportional to aggregate output, and that the latter is demand determined, influenced by international competitiveness (influences external demand), and house prices (wealth effect[41] and also construction demand – the parameter from the construction equation (4) reappears here). Inertial factors are also influential. Government demand *g* is an additional, potentially endogenous factor, included to flag also the many other exogenous elements which could be added to a model for estimation (raw material costs, productivity changes etc).

(5) $l_t = \mu l_{t-1} + (1-\mu)[(\gamma_1 + \xi)(p_{t-1}^h - p_{t-1}) - \gamma_2(w_t - p_t^m) + \gamma_3 g]$

A partial adjustment equations for the labour force is added, effectively modeling migration. (Again we ignore the many other exogenous terms that could be relevant – foreign wage rates, social benefits etc.)

(6) $n_t = n_{t-1} + \zeta(l_{t-1} - n_{t-1})$

The role of rational expectations is suppressed[42] in the modeling of expected price inflation, for simplicity and allowing greater clarity of the mechanisms with which we are chiefly concerned here. Thus we base the calculations on the partial adjustment mechanism, $\pi_t^e = \pi_{t-1}^e + \varphi(\pi_{t-1} - \pi_{t-1}^e)$, leading to:

(7) $p_t^e = (1+\psi)p_{t-1} + (1-\psi)p_{t-1}^e - p_{t-2}$

[40] Actually, this is more appropriate for the price of a new house on marginal land. Average house prices will include location premia for the land.
[41] The long-run wealth effect is understated here for the reasons given in the previous footnote.
[42] As indeed in Deroose et al. and many similar exercises. Techniques for solution of dynamic macroeconomic models with Rational Expectations are discussed in Sargent (1987).

For constant values of the exogenous variables p^m, r, and g, the steady-state equilibrium of this system can be solved to yield:

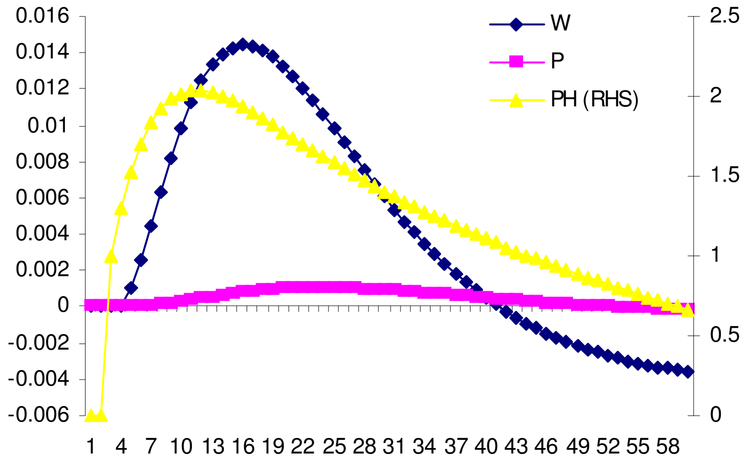
$$w_\infty = p_\infty = p_\infty^h = p^m;$$
$$l_\infty = n_\infty = \gamma_3 g$$
$$h_\infty = [\beta_1 \gamma_3 g - \beta_2 r] / \beta_3$$

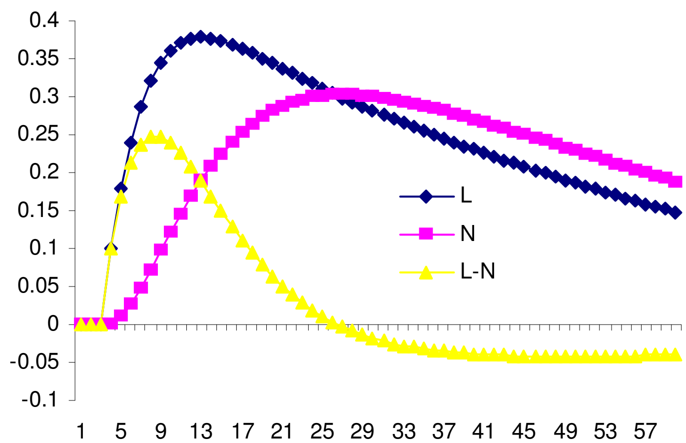
Thus, the long-run labour force and employment is proportional to the exogenous spending variable, the housing stock is also permanently influenced by the interest rate. The nominal variables are homogeneous of degree one in the exogenous import price. (These results reflect the medium-term perspective in which no government balance sheet constraint is imposed.)

Simulating this model reveals the reinforcing nature of the migration and construction channels on the duration and magnitude of the boom resulting from an initial fall in the nominal interest rate. Figures 1 (a-c) show the simulated timepath of the variables. Time is on the horizontal axis; the vertical axes show deviations from initial equilibrium. The scale and timeperiod is wholly notional – the main interest lies in the overall shape of the simulations. Figures 2 (a-b) show how the timepath of the real wage rate and of employment or output vary depending on whether the migration or construction channels are suppressed (ζ =0, ξ=0, respectively). Here perhaps is the key to extended duration of Ireland's boom through the EMU years, an interpretation which is supported by the very high share of output taken by construction in recent years.

The other key exogenous variable which has altered in the early EMU years is external competitiveness. Simulating the model also with a boost to external competitiveness shows that this enhances the boom (Figure 3 a-b), but also that a reversal in competitiveness has the potential to choke off the boom.

Figure A.1: *Simulated effect of a sustained fall in interest rates*





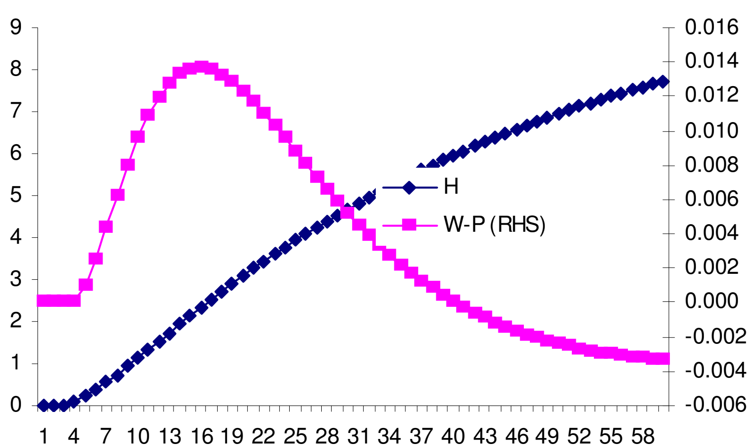
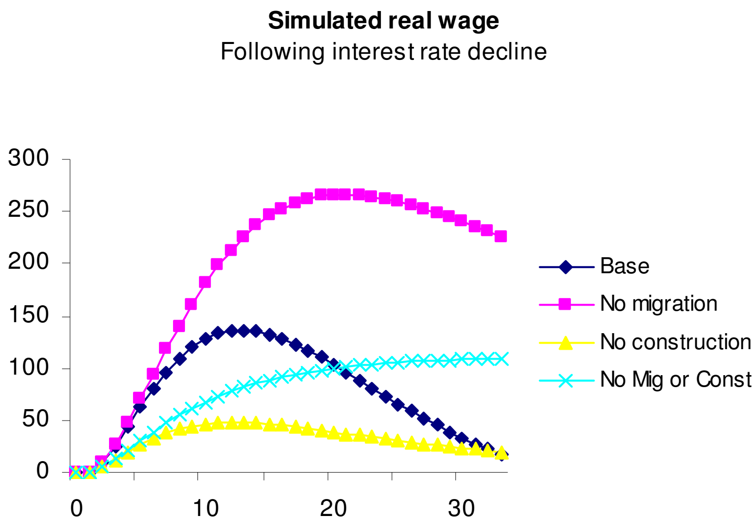


Figure A.2: *Impact of a fall in interest rates if migration and construction channels not available*



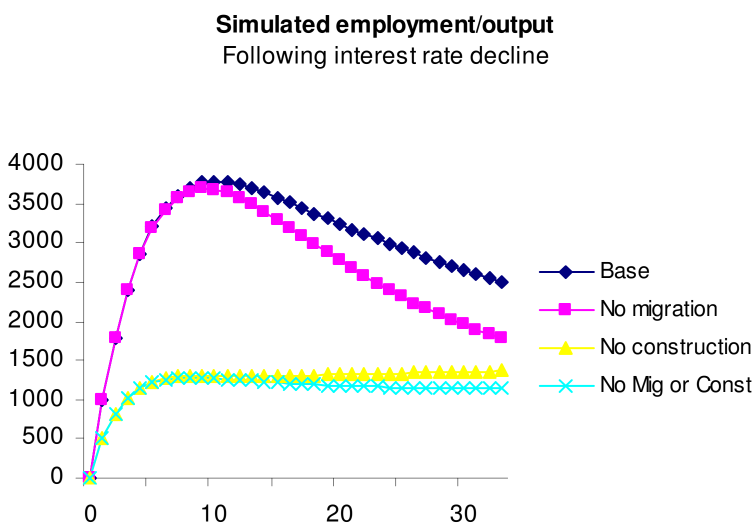
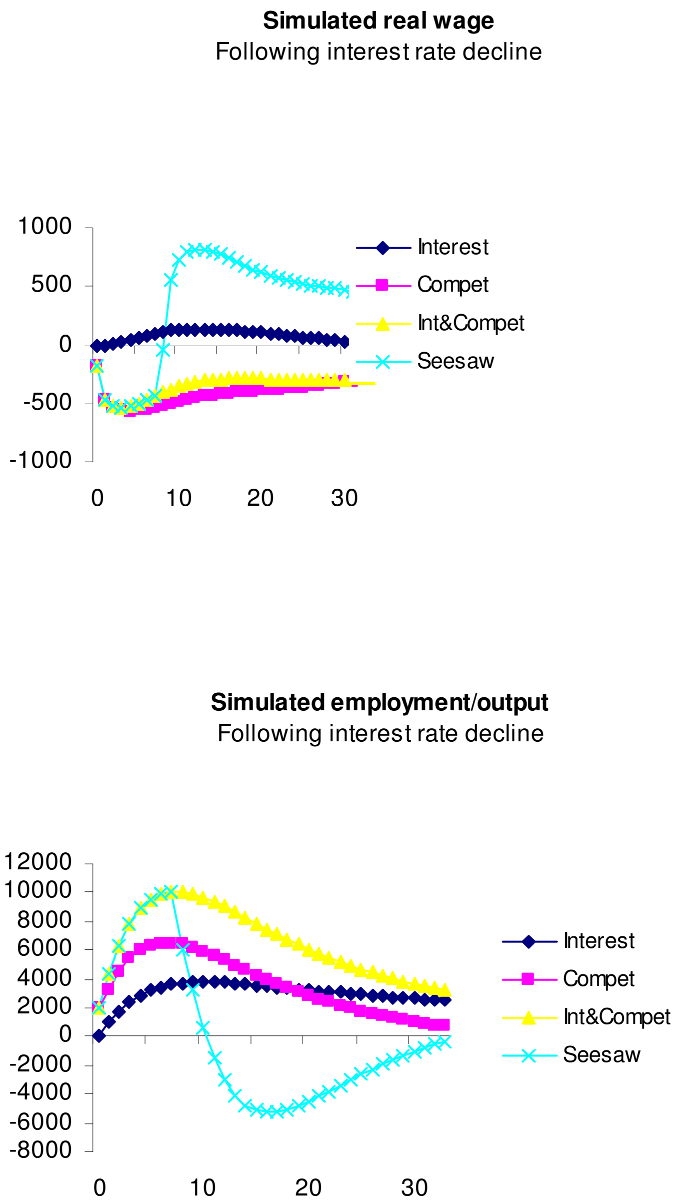


Figure A.3 *Simulated effect of a fall in interest rates and exogenous competitiveness change*



Note: Parameter values: $\alpha 1$=0.9; $\alpha 2$=0.1; $\alpha 3$=0.1; $\beta 1$=3; $\beta 2$=20; $\beta 3$=0.1; $\lambda 1$=$\lambda 2$=0.1; μ=0.5; v=0.9; ψ=0.9; ζ=0.1; ξ=0.1; r=-0.05; pm=0.2. Apart from $\beta 1$ $\beta 2$ based roughly on linearization of affordability conventions, and the last two, these choices are somewhat arbitrary. Hence the calculations can only be taken as indicative.

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